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Amendment to the Boiler Inspection Act

Elsewhere in this issue is published the substance of the amendment to the Locomotive Boiler Inspection Act which has been passed and is now a law—Public Statute No. 318. The change made by this amendment is the insertion of "Locomotives and Tenders" where "Locomotive Boilers" appears in the original act. In other words, the Bureau of Locomotive Boiler Inspection has been given authority over the entire locomotive and tender. Some of the effects this amendment may have on the railways were mentioned in an editorial published in the *Railway Age Gazette* of February 19, on page 293. Now that it has become a law it is very necessary that the railways immediately formulate rules, in conjunction with the federal authorities, to govern this inspection. It is expected that the time allowed for this tremendous task will be only three months, and no time should be lost in replying to the circular of the Special Committee on Relations of Railway Operation to Legislation, which has just been issued in regard to this amendment.

The West Virginia Cases

The United States Supreme Court has held the West Virginia two-cent fare law unconstitutional, as applied to the Norfolk & Western, because its operation would not permit a fair return on the value of the property used in passenger service. The Norfolk & Western made its appeal on this ground, and separated its freight and passenger expenses as best it could, and the Supreme Court has upheld the appeal. In 1913 the Supreme Court decided against the Chesapeake & Ohio in that company's appeal from this same West Virginia law. In that case the grounds of appeal by the railroad were: (1) that the penalties for violation of the law ($50 to $500 for each offense) were excessive; (2) that in limiting the application of the law to companies operating 50 miles or more there was an unreasonable and arbitrary discrimination; and (3) that the law constituted an interference with interstate commerce. The court held that: (1) the penalties could not be applicable until the litigation had ceased and that therefore the company could not appeal against penalties which had not yet been incurred; (2) that the limitation as to length of road was not unreasonable or arbitrary; and (3) that the law must be regarded as applying only to intrastate business and was not, therefore, an interference with interstate commerce. The Chesapeake & Ohio's passenger receipts per train-mile are approximately $1.40, as against the Norfolk & Western's $1.36, and the Chesapeake & Ohio's costs are probably more than correspondingly higher than the Norfolk & Western's because of the terminal expenses at Washington, into which the Norfolk & Western does not run, and at Cincinnati, where the Norfolk & Western probably has a much less expensive entrance than the Chesapeake & Ohio. The Supreme Court has apparently set its seal of approval on the theory which was advanced by the Interstate Commerce Commission, and by its counsel, Mr. Brandeis, in the rate advance case that each class of traffic should be sufficiently remunerative to bear its burden of interest and overhead charges. The Chesapeake & Ohio did not, however, base its appeal on this ground in the West Virginia case.

The Unemployment of the Employer

One of the best things that have been said regarding the business situation in the United States was said by President William Sproule of the Southern Pacific in his recent address at the annual dinner of the Traffic Club of Chicago. He remarked that the industrial depression through which we are passing is chiefly due to lack of confidence produced by indiscriminate attacks on business men and business concerns. He added: "It is the employer who is first out of employment. As a natural sequence he is followed by the employee who next finds himself out of work.

Unemployment begins only when the employer himself begins to be unemployed." The gist of the whole matter is in the last sentence. Labor becomes unemployed only when the employer becomes unemployed, and it becomes unemployed only in proportion as the employer becomes unemployed. On the other hand, when the employer is fully employed labor is also. Bearing these facts in mind, the remedy for present conditions becomes obvious. It is to give employment to the employer. Who is the employer? He is the man with capital to invest. Therefore, to get him employed it is necessary to furnish him good opportunities for the investment of his capital. There is no want of idle capital. There is a glut of it. Why is it not being invested? Because there is hardly a large branch of industry left in which capital can be invested with any assurance that it will not be subjected to unfair and destructive attacks by the state and national governments. President Wilson recently appealed to business men to help the administration restore prosperity. Prosperity can be restored and maintained only by the activity of business men. The government may help or hinder them in doing so, but it can only help and hinder, and it is a crowning absurdity to suggest that business men come to the help of the government to restore prosperity. It is quite rational, on the other hand, to suggest that the government come to the assistance of the business men. We have been acting on the foolish assumption that government activity makes prosperity; and that is the main reason why the employer, and along with him the employee, have been so long unemployed.

AN IMPORTANT RAIL ORDER

NO recent event in the steel rail industry equals in importance the placing of an order for 35,000 tons of 90-lb. open hearth rails by the Illinois Central with the Algoma Steel Company last week. This order is especially significant for three reasons, the price of $27 per ton delivered at Chicago, the giving of the order to a Canadian mill, and the acceptance by the mill of the condition that the rails shall be rolled under the American Railway Engineering Association's specifications, with the inclusion of the nick-and-break test for every ingot.

The acceptance of the nick-and-break test by the manufacturer marks a great step in advance for the railways which has been contended for by various roads for the last few years without success. Even within the past month one large road failed, after making a special effort, to secure the insertion of this clause when placing a large order with an American mill. The manufacturers have opposed this test, claiming that its adoption will decrease the output of the mills, increase the cost of manufacture, etc. The Algoma Steel Company has rolled rails under these specifications for a Canadian road very recently without finding these objections serious. In fact, the number of rails rejected was materially less than the number which would have been rejected under the ordinary specifications because of the reduction of the unit of inspection and thereby of rejection from the heat to the ingot, while at the same time this test resulted in the detection of a considerable number of piped rails that would have been accepted under other specifications. The limited trial has, therefore, resulted in a saving to the mill as well as in a greater security to the purchaser.

The reduction in price is over $3 per ton as compared with those quoted on ordinary open hearth rails by the mills in this country. While the mills have stated that they would have to add a considerable premium to comply with the nick-and-break test, no road has secured a definite quotation. However, it is estimated that the price made to the Illinois Central is at least $5 per ton below the figure any American mill would have quoted with the inclusion of this specification. While any railroad officer would naturally favor a home manufacturer, and especially one located on his lines, other things being equal, it would have been difficult for the officers of the Illinois Central to have justified an increased expenditure of $175,000 for this reason alone. It is undoubtedly true that if the American mills had met this price they would have received the order. The railways have been criticized severely at times for allowing traffic conditions to influence unduly the purchase of materials. The action of the Illinois Central shows that this attitude is not universal. It is well known that in spite of variations in business conditions and fluctuations in the prices of other steel products, the price of steel rails, comprising one of the largest steel tonnages, has remained constant at the basic price of $28 for Bessemer steel ever since the formation of the United States Steel Corporation in 1901.

The Canadian mill has been criticized for quoting a low price in order to dump its surplus product in this country. But the steel companies of this country have followed the same practice, and their officers have publicly justified their action on the same grounds on which the Canadian mill is now acting. With business conditions as they now are the railways have the means in their own hands of defeating the arbitrary attitude assumed by the manufacturers regarding prices and the revision of specifications.

THE STATE COMMISSIONS AND THE WESTERN RATE CASE

OUR contemporary, the Traffic World, is not in any sense a "railway organ," as the *Railway Age Gazette* is often accused of being. It is devoted to the interests of both the railways and the shippers. Therefore, it is significant that it has been denouncing the part being taken in the western rate advance case by a number of western state railroad commissions, and especially by Clifford Thorne, of the Iowa commission.

Sixteen state commissions, without any investigation of the merits of the proposed advances in interstate rates, organized to oppose them. They are using for this purpose taxes raised from the public, a large part of which has been collected from the railways. They are also accepting voluntary contributions in support of their work from interested shippers. Among the advances proposed are some in the rates on packing house products; and the embattled commissions, it is announced in the newspapers, have received and accepted a contribution of $5,000 from the western meat packers. Mr. Thorne is appearing in the dual role of attorney for the state commissions, in which capacity he claims to represent the public, and of attorney for the packers and other shippers, in which capacity he represents private interests.

The Traffic World has questioned not only the propriety, but also the legality of the conduct of the state commissions, and especially of Mr. Thorne. It maintains that the Iowa law does not authorize the state commission to attack proposed advances in interstate rates, but only interstate rates already in effect. Furthermore, it does not authorize the chairman of the state commission, but only the state commerce counsel, to appear for the state in cases involving interstate rates. Finally, even if the chairman may usurp the functions of the commerce counsel, as Mr. Thorne is doing, there is, our contemporary maintains, a provision of the law which prohibits the commerce counsel from appearing as attorney in interstate rate cases for special interests at the same time he is appearing for the state. This provision is as follows: "No person . . . who has in any way or manner pecuniary interest in any corporation or business subject to the jurisdiction of the state board of railroad commissioners or Interstate Commerce Commission shall be eligible to said office (of commerce counsel) and the entering into the employ of or acquiring of any stock or other interest in any such corporation or business by such attorney after his election or appointment shall disqualify him from holding such or performing the duties thereof." "We think," says the Traffic World, "this sufficiently bars Mr. Thorne from acting under the privileges of commerce counsel even if otherwise it would be proper."

To the question of the propriety of the appearance of state commissions in interstate rate cases there can be only one

answer. In a letter to the Traffic World Mr. Thorne defends his course, and says state commissions have two principal functions; first, that of hearing state rate cases, and, second, that of appearing as parties in interstate rate cases. It is obvious that in hearing state rate cases the state commissions should be fair; and it is equally plain that it is physically impossible for them to be fair in deciding state rate cases if they are constantly appearing as parties and attorneys against the railways in interstate rate cases. The two functions are incompatible. Mr. Thorne himself is the best proof of this. In appearing in interstate rate cases he is always more narrow, unreasoning and bitter against the railways than any other attorney for the shippers; and in his capacity as a judge in state rate cases his attitude is the same as is his attitude as an attorney in interstate cases. Probably there is not in the United States another man so perfectly unfitted by his prepossessions and attitude to sit in judgment on railways as is Mr. Thorne; and yet, as chairman of the Iowa commission, he constantly sits in judgment without any apparent consciousness of his unfitness and the reasons for it.

No commission with any sense of fairness or propriety would voluntarily appear as a party in a case involving the unreasonableness of interstate rates, knowing that the reasonableness of practically the same rates on state business probably would soon come before it to pass on in its quasi-judicial capacity; and no law should require or permit it to do so. And it is exactly as great a breach of propriety for a state commissioner to appear as an attorney for anybody to oppose advances in rates as it would be for him to appear as an attorney for the railroads to advocate advances in rates. If the states are to intervene in such cases they should intervene through the office of the attorney-general or some similar office.

But, then, everybody long has known what to expect from most of the western state commissions. With a few exceptions they always have been composed chiefly of cross-roads demagogues. Never has there been constituted any equal number of public bodies which united so much power to so little capacity for properly exercising it. Inspired by petty political motives, devoid of expert knowledge or training, reckless as to the economic results of their acts and incapable of foreseeing what they would be, or of understanding what they have been, such state commissions as those appearing in the western rate case have done almost nothing but harm, both to the railways and the public.

Unfortunately, the public does not yet realize this. But it will in time. It cannot be fooled forever. Already the public is beginning to awaken to the fact that there are vast areas in the West which have insufficient railway facilities or none at all, and that railway development in that section has almost stopped. The public is beginning to ask the reasons for this situation. In due time it will learn them. And then the type of railroad commissioner now prevalent in the West will rapidly lose his popularity. For the transportation and business conditions now prevailing in the West, in spite of its big crops, are very largely due to the kind of men it has been putting on its railroad commissions and in other public offices. In time the public will find this out.

And the wait until the public awakens to the true situation may not be long. For the state commissions are co-operating ably with their critics in demonstrating their true characters. What could be better adapted to destroy public confidence in them than the fact and the manner of their appearance in the western rate case? They are there nominally as representatives of the public; and yet their attorney appears also as attorney for private interests, among whom are the meat packers, who have contributed $5,000! Knowing the solicitude which the packers have always manifested both for the farmers from whom they buy live stock and for the consumers to whom they sell meat; knowing, also, the pious zeal which the packers have ever displayed in obeying the anti-trust act and the anti-rebating laws, the public is apt to question the undivided and undying fealty to its interests of persons who are receiving and spending the public's money and that of the packers at the same time and for the same purpose!

NEW BOOKS

Proceedings of the Master Car Builders' Association. Compiled and published by Joseph W. Taylor, secretary of the association, Chicago, Ill. 968 pages, 6 in. by 9 in. Two volumes. Bound in cloth. Price, $5 per volume.

These volumes cover the official proceedings of the forty-eighth annual meeting of the Master Car Builders' Association, which was held in Atlantic City, N. J., in June, 1914. Volume I contains a full report of the convention and Volume II contains the complete rules of interchange brought up to date and all of the standard and recommended practices of the association, with drawings, together with the results of letter ballots sent out during the year. Pre-eminent in the proceedings is the report of the committee on Coupler and Draft Equipment. This report, together with its discussions, occupies 76 pages. Changes in the rules of interchange are contained in the report of the arbitration committee. Volume I also contains a list of members, with the number of cars they represent, and the constitution and by-laws of the association.

Universal Safety Standards, Machine Shop and Foundry. By Carl M. Hansen, consulting safety engineer. Illustrated and indexed. 312 pages, 5 in. by 7½ in. Bound in leather. Published by the Universal Safety Standards Publishing Company, 12th and Race streets, Philadelphia, Pa. Price $3.

This is the second edition of this book and it has been revised and enlarged. It is intended as a reference book of rules, drawings, tables, formulas, data and suggestions on safety devices and protection for machines in the machine shop and the foundry and was compiled under the direction of and approved by the New York Workmen's Compensation Service Bureau. The book is classified into four parts, general, machine shop, foundry and rules and practices; each division touches on a majority of the cases that arise under that classification. It gives a collection of conditions ordinarily found in machine shops and foundries, and indicates the proper safeguards to apply, treating the conditions with clearly worded, brief specifications and employing numerous illustrations. The book takes up conditions in the construction of the plant, and also follows the product from the receiving department to the shipping room and shows how in each instance safety measures may be applied. The illustrations are particularly good, the machines and buildings being printed in black, while the safety devices are printed in color, making them stand out very clearly.

Rate Construction Guide. Compiled and published by F. W. Fairbairn, commercial agent, Cincinnati, New Orleans & Texas Pacific Railway, Cleveland, Ohio. Bound in flexible leather. Price $5.

This is the 1915 edition of a freight rate guide published for the purpose of assisting in the location of the various tariffs for ascertaining the lowest prevailing freight rate on shipments from Central Freight Association, Eastern Trunk Line Association and New England Freight Association territories to all points in the United States. The purpose is to assist in making calculations of freight rates by indicating in what tariffs the various combinations are to be found, and in addition to its usefulness in a tariff reference file provides a means for equipping an office with a file of such of the tariffs as are necessary, thereby presenting indiscriminate requisitions for others which would not be of interest. While of particular benefit to shippers, it has also been adopted by a number of railroads for their rate clerks at principal stations.

Letters to the Editor

THE ALL-AROUND SUPERINTENDENT

Kansas City, Mo.

To the Editor of the Railway Age Gazette:

The editorial comment on "Why Do Not Chief Despatchers Receive More Recognition?" in your issue of January 15, opens the way for a few more remarks on the subject. The editor says that little or nothing was brought out concerning other qualifications than experience, and that a superintendent is liable to make a bad mistake by continuing to live in the department from which he came. Inasmuch as transportation is the only thing a railroad has for sale, he would not make a very large mistake by living a while in that department.

Who is the man on the job who has had an opportunity to thoroughly educate himself along that line? It requires extraordinary experience in the study of human nature in order that a superintendent may surround himself with subordinates that will make his position a success. He cannot do it alone, and must rely on men who are experts in their respective departments and whom he can trust to the last letter. Therefore, a superintendent who can effect such an organization is bound to have success. Without a thorough organization he will be at sea. The chief despatcher, in his long experience, has had an opportunity to acquaint himself with the fundamental principles of the various departments. If it is not necessary for a master mechanic to have knowledge of telegraphy and train despatching to be a superintendent; why would it be necessary for a chief despatcher to have served an apprenticeship as a machinist to fill the position of superintendent? What amount of expert figuring has the master mechanic to do in connection with his position? To keep within his allowance and see that the power and equipment is turned out in good shape. The chief despatcher has to figure where and how the company will derive the most revenue out of it, and at the same time manipulate it with the least expense.

If, as the editor says, the superintendent would no doubt do a good turn at the farmer's house, ten miles away, who would be the better fitted to go there and settle a claim, or look into the matter of securing additional right of way, the chief despatcher or the bridge carpenter? How would the civil engineer compete with the chief despatcher in obtaining the maximum ton-miles per train and at the same time keep up the standard of service and avoid overtime? Again, as to the matter of the chief despatcher feeling the importance of his promotion; I do not believe this weakness would be any more conspicuous than in the case of any other employee, and in some cases not so apparent. If the chief despatcher so handles the engines, cars and men, that the superintendent is not criticized by his superiors, he has made that superintendent's success. The superintendent may have washouts, fires, engine failures and derailments which may be chargeable to the other departments, but these do not come every day. But keeping the passenger trains, locals and red ball freights on time; keeping the line cleaned up, the overtime down, stock trains moved without damage claims, are things that come up every day and every night; and who is the man that makes the showing for the superintendent in this direction? It is not the roadmaster or the chief clerk; it is the despatcher, who is on the job all the time, working for the success of the chief despatcher and he for the superintendent. It has been said that a chief despatcher can either break or make a superintendent and there is in that idea more truth than poetry.

If, as Mr. Hobbs says, 75 per cent of the presidents, general managers, etc., were once chief despatchers, this is a credit to the despatchers; but it does not seem that the percentage in the last few years is being maintained. However, I venture to say that nine-tenths, at least, of the officers named in connection with Mr. Hobbs' remarks will say, if questioned, that their success as superintendents and general superintendents was due to the work of their chief despatchers more than to any other one department.

It is quite natural for men promoted from the different departments to pick lieutenants from the department from which they came, and no doubt at times there are good reasons for it; but I believe I am safe in still standing up for the chief despatchers, for they are justly deserving.

C. L. J.

MODIFY THE VALUATION LAW

New York, N. Y.

To the Editor of the Railway Age Gazette:

The recent editorial on the subject of valuation is of not a little interest to the writer, who has felt for some time that he was rather in the minority, at least among those generally inclined to favor the railroad side, or their point of view, in believing that there were many benefits to be derived from a *properly made* valuation, and possibly also that these benefits might be worth the cost.

In the discussion of a paper presented to the American Society of Civil Engineers in January, 1911, the writer stated: "That valuations properly made may be the means whereby confidence may be restored, not only in the mind of the general public, but in that of the investor; but, in order to obtain this result, the railroads should urge, with all the power they possess, the necessity of having such valuations made by a body of men, some of whom, at least should be engineers big enough to entitle their opinions to the respect of both sides, and thoroughly qualified by training and experience for the work."

It was further pointed out, and this is a point which many railroad men ignore, either deliberately or unconsciously, that "There need not necessarily be any relation between rate regulation and rate-making. Rate regulation can well be confined to rates in the aggregate; rate-making applies to the adjustment of individual rates, and must necessarily be the work of men well versed in all the varied elements which control it and the particular conditions affecting the business of each particular road."

Your suggestion that the railways be taken a group at a time is an excellent one. If the energies of the commission could be concentrated say, for instance, on the New England group, or on the New York-Chicago trunk lines (leaving out lateral offshoots), some definite results could be obtained within a reasonable time.

There can be little doubt that properly made valuations will not only show that the railroads are not, on the whole, over capitalized, but will show the financial side in a favorable light, and if the general public once gets this idea firmly fixed in its mind, as it will if it be established by a thoroughly competent commission, it will be of more benefit to the railroads than the cost of getting the information. It is also not an unmixed evil for the railroads to be compelled to have their maps, records, etc., in good shape, as there have been not a few dollars expended for improvements, which might have been spent to better advantage had there been available, adequate information for a broad-minded view of the whole situation, rather than a restricted view of some particular detail.

It has seemed to the writer, in view of the knowledge now acquired by the Interstate Commerce Commission and by the various official railway committees having the subject of valuation in charge, that Congress might be requested to modify the law containing the instructions under which the valuation is now being conducted, and among other things to include your suggestion to complete the valuation by sections instead of scattering its energies all over the country, even though this will not appeal to the pork barrel statesman, and possibly also to make the determination of the value wholly on the basis of the cost of reproduction new.

F. Lavis,
Consulting Engineer.

Hearings on Western Freight Rate Advances

Testimony on Financial Condition of 41 Roads Operating 98,000 Miles. Earnings, 7 Per Cent on $28,000 Per Mile

Statistical and general testimony as to the financial condition and necessities of 41 western railroad systems occupied the first four days of the hearing before Commissioner Daniels of the Interstate Commerce Commission, on the application of the roads for advances in a number of commodity rates, which began at Chicago on March 4. Four days were allotted for railroad evidence supporting the claim that increases in earnings are needed, which was followed on Tuesday, Wednesday and Thursday of this week by testimony bearing especially on the advance on grain and grain products. Other days have been set aside for similar testimony as to other commodities, and four days, March 30 to April 2, will be allowed for evidence of protestants and interveners in rebuttal of the evidence of the carriers.

Edgar Watkins, examiner-attorney for the commission, sat with Commissioner Daniels, and the commission was also represented by M. O. Lorenz, statistician. Those who appeared in opposition to the proposed rate advances, included Clifford Thorne, chairman of the Iowa Railroad Commission and of a committee representing 16 western state commissions. He said he also represented several large organizations of shippers. Luther M. Walter and W. E. McCormack, appeared for Chicago packers.

Members of this committee were present from the state commissions of Kansas, Nebraska, South Dakota, Iowa, Louisiana and North Dakota. Appearances were also entered for a number of large companies and organizations of shippers, including the Chicago packing companies and the coal and grain interests.

Their representatives who took part in the cross-examination were Luther M. Walter, W. E. McCormick and W. E. Lamb, representing the packers.

OPENING STATEMENT BY C. C. WRIGHT

The scope of the case was outlined by C. C. Wright, general solicitor of the Chicago & North Western, who is chairman of the railroad committee in charge of the case. The other members are T. J. Norton, general attorney of the Santa Fe; W. F. Dickinson, general attorney of the Rock Island; A. P. Humburg, commerce attorney of the Illinois Central; C. S. Berg, assistant general counsel of the Missouri, Kansas & Texas, and R. B. Scott, general attorney of the Chicago, Burlington & Quincy.

Although this has been called a general rate advance, Mr. Wright explained, it is general only in the sense that the advance covers rates over a broad territory, and that the advances were brought about, in a measure, and are to be in a measure justified, by the needs of the carriers for additional revenue.

The principal products upon which the advance is sought are grain and grain products, livestock, fresh meats and packing-house products, coal, hay, fruits and vegetables and cotton piece goods. The hearing also involves the propriety of the elimination of certain privileges which have prevailed in parts of the territory involved, in relation to stoppage in transit, storage and concentration.

The territory involved includes the Western Trunk Line territory (from Chicago west to the Missouri river), the Southwestern Tariff Committee territory (west of the Missouri river and south of Kansas and Missouri), and part of the Trans-Missouri territory (Nebraska, Kansas and eastern Colorado).

The advance is not the same on each commodity; nor does the advance on each cover the same territory. Each has been treated separately with a view to establishing a more equitable relation of rates by advancing those which were too low. Mr. Wright described briefly the application of the advances, saying they would be taken up later by witnesses at the separate hearings devoted to those commodities.

"The amount of the increase in revenues," said Mr. Wright, "is by no means as great as has been stated in public print; nor is it anticipated that it will meet the necessities of the carriers for additional revenue. It is impossible at this time to state definitely, but it is believed that it will not amount to more than $10,000,000 to the 41 roads principally interested in this advance, which have a combined mileage of over 98,000 miles. In other words, it will amount to but little over $100 per mile.

"It is the purpose of the carriers to further limit the privileges which have been granted in connection with certain rates and to publish advances on various miscellaneous commodities, which need not now be particularly considered. The tariffs for some of these advances have already been filed. A statement will be furnished to the commission, at the hearing as to each commodity, of the amount of increased revenue to be derived by reason of the advanced rates.

"Tariffs advancing interstate passenger rates to substantially 2½ cents a mile have been filed, and it is hoped that a like advance can be made in the intrastate passenger rates. That matter is not before the commission upon this hearing, but we desire that some of the general evidence introduced in this case be considered in that case.

"Owing to the fact that an advance has been made at about the same time on a number of commodities covering a large territory, it has been deemed proper to present to the commission at this time, a showing of the financial conditions of the various carriers operating in the territory covered by the advances. It is confidently believed that this will demonstrate that the carriers are in need of additional revenue in order to maintain the proper, efficient and safe service demanded by the public, and at the same time enable the carriers to receive such fair return upon the value of their properties as shall sustain their credit and enable them to meet the public's demands.

"The evidence in relation to the specific rates will show that the advances have been made upon rates which were both actually and relatively too low. In other words, the increased revenue is sought by means of a better adjustment in relation of rates, having in mind the suggestions heretofore made by the commission as to the equalization of rates and the removal of discriminatory practices.

"This case will not be presented as the application of any single road. It will be presented, substantially as if the roads were owned and operated as one system. The fact that one road of this system may be making a considerable return, and others of them be in the hands of receivers, is not thought to be the controlling feature, any more than it would be proper to estimate the needs of a single line by the separate returns from different branches of such line. It is the contention of the carriers that taking the railroads together in the territory in question, their revenue is not sufficient. Conditions are such in the west that we do not believe it possible to select any small number of roads which could be said to be representative or controlling.

"For the purposes of comparison of the situation west of Chicago, with the condition in the eastern district, we shall present to the commission data in relation to the earnings, expenses and net returns, covering practically all of the lines operating west of Chicago. However, many of the so-called strongest roads in the western district, such as the Great Northern, Northern Pacific and the Union Pacific, have practically no interest in the advances under investigation.

"Therefore, in order to present to the commission the situ-

ation in relation to the roads that are materially interested in this proceeding, and whose revenues will be affected; that is, those whose principal interests are in the Western Trunk Line territory and Southwestern territory, and that part of the Trans-Missouri territory in which advances are made, we have selected all of the principal lines (treating them as systems), which operate in Western Trunk Line territory, and Southwest territory, and will present the combined results of their operating revenues, their expenses and net returns. They will be presented in a consolidated group.

"In order that the commission may be better informed as to the situation as between the Western Trunk Line territory and the southwestern territory, the carriers will present the combined statement of 10 of the leading systems operating in the Western Trunk Line territory. As representing the southwestern territory, an equal number of the principal systems have been selected, and the results of their operations have been combined in another group. These grouped figures will be supplemented by the combined showing of two other groups of roads in which are included all of the lines having 1,000 miles or more, which operate exclusively in either the Western Trunk Line or Southwestern Tariff Committee territory.

"This grouping, or division of the roads into groups, has been selected as in our judgment best portraying the true situation, and for the purpose of eliminating as far as possible the influences of the rates and transportation conditions upon those roads that serve trans-continental territory, and that portion of the Western Trunk Line territory in which the rates are not advanced.

"The comparison of revenues and expenses will be made, covering two periods, one, the seven years, 1901 to 1907, inclusive, and the other the period from 1908 to 1914, inclusive. The latter period commences with the revised, uniform system of railroad accounts as prescribed by the Interstate Commerce Commission, and covers substantially the period during which the commission has had the power to authoritatively fix maximum rates. The results of the operation of each year will be given separately, and the general comparison will indicate a decreasing ratio of return upon investment in road and equipment, not only as between the two periods compared, but as between comparable years in the latter period. It will show that the operation ratio is increasing, and that there has been a very large addition to the properties of the carriers.

"This compilation will show that the net operating income of the carriers interested in this proceeding, for the average of the last seven years, has not been what the courts have held to be a fair rate of return upon their properties, when considering the question of confiscation of property, on an amount to exceed $28,000 per mile of road operated.

"The records of the Interstate Commerce Commission show that the carriers in the territory involved, have been called upon to invest in their properties, by way of additions and betterments, more than $100,000,000 a year during the last seven years, and yet their net revenues are but slightly higher than they were during the prior seven years. In other words, that there is no substantial return upon the new investment which has been made during the last seven years. It will also be demonstrated that the additional investment in road and equipment is being taken care of by bond issue; that is by borrowing, rather than by taking in new partners by the sale of stock."

OPENING STATEMENT BY CLIFFORD THORNE

Mr. Thorne also made an opening statement, saying that the time allowed for investigation prior to the hearing had been entirely inadequate and that formal application would be made for the additional time provided by the statute and deemed necessary in order to complete the investigation.

"These advances under consideration," he said, "are only a part of a general movement that has been in progress for over a year, and these increases are only a fractional part of the total advance which these railroads are trying to put through. The advances permitted during the past year by this commission, added to those involved in the original suspension order in this case, added to those involved in the 16 supplementary orders issued by the commission, added to those now being filed, make a total which we believe, from what investigations we have made, can be conservatively estimated will cause a 10 per cent increase in the freight revenues of these railway companies.

"Estimating that two-fifths of the passenger travel will be on mileage books, the average increase in passenger revenues will amount to approximately 20 per cent.

"The magnitude of the sums involved in a 10 per cent increase in freight rates, and a 20 per cent increase in passenger rates, may be appreciated when you consider that the total freight revenues of the 37 railroads embraced in your original suspension order, aggregated last year $700,000,000, and their passenger revenues amounted to approximately $195,000,000.

"Though our investigation has not been completed, that which we have to offer will show conclusively as to representative railroad companies in this territory:

"That the credit of these western railway companies is better than that of representative companies in any other line of business in the United States. That the depression of the past year was not due to freight or passenger rates, was not peculiar to the railroad industry, but applied to business generally throughout the world. That, disregarding extremely prosperous and extremely lean years which come to all business, these western railway companies during recent ordinary normal years have earned more, both gross and net, per mile of line and per train mile than ever before in their history. That these companies have been able to maintain their properties during recent years at a higher standard than ever before in their history; and they have also set aside large sums of money out of earnings for betterments and improvements and outside investments, which should have been made from capital."

TESTIMONY

The foundation of the railroads' case was laid by C. E. Schaff, president of the Missouri, Kansas & Texas, who read a statement as to the need for increased revenues, in addition to a discussion of the special needs of the roads in the southwest. He was followed by S. M. Felton, president of the Chicago Great Western, and B. F. Bush, president of the Missouri Pacific, who discussed the condition of the roads in Western Trunk Line and southwestern territory with illustrations from the experiences of their own roads. The three presidents took the position that western railroads should be allowed to earn 7 per cent on the investment, that the situation should only be considered with reference to the condition of all the roads in the territory, and showed that the roads involved in the case during the past seven years had earned 7 per cent only on a very low sum per mile of line, a large part of the investment receiving no return. They also discussed the increasing difficulty of financing railroads. The financial condition of the roads from the bankers' and investors' standpoint was discussed by Festus J. Wade, president of the Mercantile Trust Company of St. Louis, and James W. Lusk, one of the receivers of the St. Louis & San Francisco, took the stand, as a man who had had no previous connection with railroad operation, to explain the difficulty of "paying the honest debts of a railroad" under present conditions. This general testimony was supported by the presentation of elaborate statistical exhibits comparing the results of operation in the periods 1901-1907 and 1908-1914.

OUTLINE OF RAILWAYS' CASE BY C. E. SCHAFF

Mr. Schaff said in part:

"The operating results of the carriers in the western district have been growing more and more unsatisfactory year by year, and their need of increased net income has grown more pressing. We feel that the time mentioned by the commission in the 1910

western rate advance case to make application to this commission for an increase of rates has come. It is imperative that the western carriers increase their net income quickly. Three ways have been suggested by which such an increase may be accomplished.

"First, through increased operating revenues following the natural growth in population and industrial development with a resultant expansion of traffic. Admitting the possibilities in this direction, the probable results are far too slow and uncertain to meet the immediate necessities of the carriers. As the present standard of operations cannot be lowered, and as the investment in betterments, equipment and extension of facilities must increase from year to year commensurately with the increase in population and commerce of the community served, it cannot be expected that the future will show any higher returns than the past from increased operating revenues on the present basis of rates.

"Second, through economies in operation. The carriers, however, have found that their efforts to economize, even to the extent of deferring maintenance, have been without avail. The carriers will continue, as in the past, to effect operating economies wherever possible, but I see no hope for substantial relief or help from that source.

"Third, by an increase in rates. We believe that the problem can only be solved by an increase of rates, and that the experience of the past as exhibited by the statistical data to be presented here leads inevitably to that conclusion. In determining where the advances should be made, the lines have not followed the lead of the eastern lines and have not aimed at a horizontal increase of 5 per cent or any other arbitrary amount, but they have endeavored to adopt the suggestion of the Interstate Commerce Commission, and have sought to eliminate certain privileges and abuses which have been condemned or criticized by the commission, and to make such advances as would increase revenues, and at the same time more equitably distribute the benefits and burdens of the service.

"The increases asked for will not afford us all the relief necessary, or to which we believe we are entitled. As nearly as we can determine, the increases asked for, if applied to the business of the Missouri, Kansas & Texas Lines for one year, would not add to exceed $450,000 to their gross freight revenues an increase of about 2 per cent. However, following another suggestion of this commission, we are active in trying to have our rates raised on state, as well as on interstate, business, so that the needed increase will, so far as practicable, be fairly distributed—state and interstate—both passenger and freight.

"The statistical data and tables offered as evidence will show an inadequate return on the cost of property, or on any approximate or reasonably assumed value of the properties, or on any other basis upon which that return may be calculated. They will show that the book value of road and equipment of the carriers involved in this proceeding averaged $51,584 per mile operated on June 30, 1914, while the income in that year available for return on the investment, if capitalized at 7 per cent, represented a value of only $28,048 per mile operated, or little more than one-half of the book cost of the property. It must be apparent, even to those with the most superficial knowledge of railroad construction cost, that these western lines could not be reproduced for any such sum.

"The tables will show that the operated mileage has increased 12,577 miles during the past seven years, and that the property investment has increased $1,236,000,000. The lines have expended an average of $105,000,000 per year for additions and betterments, including equipment, an average of $1,970 per mile per year. The bonds and notes outstanding in the hands of the public have increased $959,000,000 in seven years. The ratio of interest-bearing obligations to the total capitalization has increased from 58.35 per cent to 62.26 per cent. The expenditure per mile for maintenance of road and equipment rose from $2,266 to $2,831 in seven years.

"The average net cost of road and equipment of the 41 western roads, or systems, divided into two periods of seven years each, 1901 to 1907 and 1908 to 1914, were: First period, 1901 to 1907, $3,430,000,000, and for the second period, 1908 to 1914, $4,570,-

COMBINED RESULTS OF OPERATION OF 41 WESTERN RAILROAD SYSTEMS, COMPARING THE PERIOD 1901-1907 WITH THE PERIOD 1908-1914

Years	Net cost of road and equipment	Average miles operated	Net operating income	Per cent return on cost of road and equipment	Value on which net oper. inc. is equiv. to 7 per cent	Balance of value earning no return	Net oper. income per mile operated	Equiv. to 7 per cent on value per mile
1901	$3,005,040,261	67,054.86	$143,281,943.04	4.77	$2,046,884,900	$958,155,361	$2,136.76	$30,525
1902	3,121,687,909	70,467.81	154,652,853.13	4.95	2,209,326,473	912,361,436	2,194.65	31,352
1903	3,336,109,179	75,591.67	163,218,476.47	4.89	2,331,692,521	1,004,416,658	2,159.21	30,846
1904	3,487,539,658	79,378.50	158,715,558.40	4.55	2,267,365,120	1,220,174,538	1,999.48	28,564
1905	3,561,291,400	81,724.85	166,081,014.50	4.66	2,372,585,921	1,188,705,479	2,032.19	29,031
1906	3,712,190,412	83,118.00	191,397,541.30	5.16	2,734,250,590	977,939,822	2,302.72	32,896
1907	3,842,316,511	85,872.00	216,885,898.39	5.64	3,098,369,977	743,946,534	2,525.69	36,081
Total 1901 to 1907 inclusive	$24,066,175,330	543,207.69	$1,194,233,285.23	4.96	$17,060,475,502	$7,005,699,828	$2,198.48	$31,407
1908	$3,957,331,754	87,580.64	$169,579,067.29	4.29	$2,422,558,104	$1,534,773,650	$1,936.26	$27,661
1909	4,079,982,221	88,635.71	188,035,808.83	4.61	2,686,225,840	1,393,756,381	2,121.44	30,306
1910	4,504,033,244	92,788.41	198,940,381.74	4.42	2,842,005,453	1,662,027,791	2,144.02	30,629
1911	4,674,459,267	95,139.98	197,179,697.73	4.22	2,816,852,825	1,857,606,442	2,072.52	29,607
1912	4,796,540,973	96,207.76	176,979,543.08	3.68	2,528,279,187	2,268,261,786	1,839.55	26,279
1913	4,907,912,434	97,237.16	217,816,890.19	4.44	3,111,669,860	1,796,242,574	2,240.06	32,001
1914	5,078,293,153	98,446.59	193,286,463.22	3.81	2,761,235,189	2,317,057,964	1,963.36	28,048
Total 1908 to 1914 inclusive	$31,998,553,046	656,036.25	$1,341,817,852.08	4.19	$19,168,826,458	$12,829,726,588	$2,045.34	$29,219
Total 1901 to 1914 inclusive	$56,064,728,376	1,199,243.94	$2,536,051,137.31	4.52	$36,229,301,960	$19,835,426,416	$2,114.71	$30,210
Totals and average 1901-1907 inclusive.	$24,066,175,330	543,207.69	$1,194,233,285.23	4.96	$17,060,475,502	$7,005,699,828	$2,198.48	$31,407
Totals and average 1908-1914 inclusive.	31,998,553,046	656,036.25	1,341,817,852.08	4.19	19,168,826,458	12,829,726,588	2,045.34	29,219

Comparison of operating results per mile operated:	Operating revenues	Operating expenses, hire of equipment, joint facilities, etc.	Taxes	Rentals—Net lease of roads	Net operating income
1901-1907	$7,466.85	$4,948.59	$231.64	$88.14	$2,198.40
1908-1914	8,815.27	6,355.93	346.81	67.19	2,045.34
Increase or decrease	Inc. $1,348.42	Inc. $1,407.34	Inc. $115.17	Dec. $20.95	Dec. $153.14
Comparison of operating results for each dollar of road and equipment cost:					
1901-1907	16.85 cents	11.17 cents	0.52 cents	0.20 cents	4.96 cents
1908-1914	18.07 cents	13.03 cents	0.71 cents	0.14 cents	4.19 cents
Increase or decrease	Inc. 1.22 cents	Inc. 1.86 cents	Inc. 0.19 cents	Dec. 0.06 cents	Dec. 0.77 cents
Percentages	7.29 per cent	16.65 per cent	36.54 per cent	30.00 per cent	15.52 per cent

000,000, or an average yearly increase in net cost of road and equipment for the second period of $1,140,000,000. The average annual net operating income for the same systems for the first period was $170,000,000, and for the second period $191,000,000. The per cent of return for the first period averaged 4.96, and for the second 4.19. So that the increase in net operating income did not, by any means, keep pace with the increase in cost of road and equipment.

"Assuming that these lines were entitled to earn 7 per cent, and capitalizing their net operating income, it will be found that the net operating income for the first period was equivalent to 7 per cent on an average valuation of $2,430,000,000, and for the second period the net operating income was equivalent to an average earning of 7 per cent on something over $2,700,000,000, which means that for the first period an average of over $1,000,000,000 investment earned no return whatever, and for the second period an average of over $1,800,000,000 earned no return whatever.

"The net operating income per mile of road for the first period averaged $2,198, and for the second period $2,045, which, capitalized on a 7 per cent basis, was equivalent to earnings on a value per mile of road of $31,400 for the first period, and for the second period of $29,200. Notwithstanding the great increase in investment, the net operating income was materially reduced for the second period.

"The average operating revenue per mile of road operated for the first period was $7,466 per mile, and operating expenses were $4,948 per mile; taxes $231 per mile, and rentals $88 per mile, leaving $2,198 net operating income per mile for the first period.

"For the second period the operating revenues were $8,815 per mile, an increase over the first period of $1,348; operating expenses were $6,355 per mile, an increase of $1,407, which more than absorbed the increase in gross operating revenue. Taxes in the second period were $347 per mile, or an average increase of $115. Rentals for lease of road decreased $21 per mile, leaving the net operating income for the second period, average, $2,045, or a decrease of $145, as compared with the first period.

"For the year 1901 the 41 systems paid out only $14,000,000 in taxes, whereas for the year 1914 they paid out $42,000,000 in taxes, or three times as much as in the year 1901. For the entire period, 1901 to 1914, 14 years, they paid out $315,000,000 for taxes.

"In the face of a declining credit, the western carriers during the three calendar years 1915, 1916 and 1917 must refund maturing obligations aggregating $203,000,000. It should be borne in mind that they must also procure not less than $3,000 per mile, or $295,000,000, of new capital, during these three years to pay for the ordinary necessary betterments and equipment required by the normal growth of traffic and demanded by the public.

"In considering the increased operating costs of the carriers, it should be remembered, among other things, that federal and state laws and regulations of recent years have contributed materially. Freight, passenger and express rates have been reduced by commissions and legislation. The government has required increased postal facilities without commensurate addition to revenue; express earnings have been curtailed by reason of the extension of the parcel post, for which the railroads are not compensated.

"The increased cost of labor is familiar to every one who has the slightest information regarding the railroad situation. Rates of pay on railroads in the west have been and now are substantially higher than in the east, and further demands are now being arbitrated in this city. The average rate of pay per day for railway employees, excluding general officers, was $2.20 in 1907, and $2.48 in 1914. If the same rate had been paid in 1914 as in 1907 by the 41 roads concerned in this hearing, their operating expenses would have been $44,800,000 less in 1914, and the net income for that year would have been correspondingly increased. The saving would have amounted to about 1 per cent on the net cost of road and equipment. The operating ratio would have been 2.76 per cent less.

"The increased cost of money to railroads is well known. In 1905 and 1906, the roads generally were able to obtain money on a 3½ per cent to 5 per cent basis. From that time, the rate has been steadily advancing and today many of the roads are paying 7 per cent and more for such small amounts as they are able to obtain. While this is partly due to the higher rate of interest generally, it is aggravated in the case of most western and southwestern railroads by the lack of a margin of safety.

"Operating economies have been innumerable. The managers have constantly endeavored to save in every detail of expenditure, and to increase the efficiency of the plant and its working organization, and have instituted numerous and varied cost-reducing schemes and devices. Much has been accomplished, and more will be accomplished, but it is a lamentable fact that reduced rates and increased expenses beyond the power of the managers to control have more than offset the lower costs which have obtained through more efficient and economical methods. Many millions of dollars have been invested in permanent improvements designed to reduce the cost of maintenance and operation.

"During the seven fiscal years beginning July 1, 1907, and ending June 30, 1914, the 41 western carriers expended for new equipment $306,000,000. The new engines acquired are larger and more powerful and are designed to draw heavier loads. Their use has enabled the average revenue trainload to be increased from 284.05 tons in 1908 to 364.07 tons in 1914, an increase of 80.02 tons, or 28.17 per cent. Increasing the number of tons and cars handled in one train is the best medium known to us for reducing transportation costs.

"The tons moved one mile in 1914 were 18,783,291,755 more than in 1908, an increase of 33.4 per cent. By the use of heavier power and the resultant increased trainload, the freight train miles, including mixed, increased only 8,068,380 miles, or 4.07 per cent.. Yet the ratio of conducting transportation expenses to revenue was practically the same in 1914 as in 1908. The new freight and passenger equipment was more strongly and permanently constructed, yet the ratio of expenses for maintenance of equipment to gross revenue increased from 14.23 per cent in 1908 to 16.58 per cent in 1914. The new freight equipment purchased during the period is also of greater capacity, but nevertheless the average revenue tons per car mile only increased from 11.11 in 1908 to 11.93 in 1914, indicating a larger proportion of less-than-carload freight and bulky and light loading traffic.

"During the seven fiscal years under discussion, the western carriers expended $433,507,867 for additions and betterments, excluding equipment. The purpose of these expenditures was either to furnish additional facilities to handle the business and relieve congestion; or to procure additional traffic; or to lay heavier rail, provide ballast, widen banks, build bridges and otherwise to strengthen and make permanent the roadway and structures in order to provide a safe roadway to sustain the heavier loads and to reduce maintenance and transportation costs; or to reduce grades to enable the trainload to be increased; or to pave streets and build stations and provide betterments required by police regulations of governmental bodies. We believe that the expenditure of most of this money was wise and profitable and a very large part of it was absolutely vital to the operation of the roads, and as much of a necessity as an operating expense.

"The ratio of total operating expenses to revenue in 1908 was 69.97 and in 1914 72.12. Comment has been made upon the fact that the operating ratio does not vary materially from year to year and that it has not actually declined as a result of the strenuous efforts to economize. This is, of course, due to those unfortunate conditions which I have referred to, beyond the control of the managements, such as wage increases, rate reductions and police regulations. Compulsory rate reductions, which have occurred in greater or less degree for many years,

are an important factor in preventing a reduction in the operating ratio.

"To illustrate: The M. K. & T. Lines for the year ending June 30, 1914, lost $676,500 by the enforcement of the two cents per mile passenger rate and $165,000 by freight rate reductions, a total of $841,500, in the states of Missouri and Oklahoma, which reduced the net earnings correspondingly. The service rendered was exactly the same for the lower rates as it would have been for the higher. Adding the $841,500 to the actual operating revenues for 1914 would have made them $32,362,688. Operating expenses would have been the same, $22,722,119. The operating ratio would have been 70.21 per cent instead of 72.09 per cent, or 1.88 per cent less than it actually was.

"The major part of the large expenditures in the improvement of the railroads is for the public safety and the despatch of business, and while some of them add somewhat to the economies of transportation, most of them are additional burdens. The *value* of the service to the public has not only been largely increased, but the *cost* of the service has been increased to the carriers."

CONDITION OF THE SOUTHWESTERN ROADS

Mr. Schaff then took up the roads in the Southwest, making comparisons with the statistics presented in the eastern case for the Central Freight Association roads. He omitted from consideration the Atchison, Topeka & Santa Fe and the Chicago, Rock Island & Pacific, because, he said, the major part of their lines are located in other states and are operated under dissimilar conditions. For the group of 22,032 miles, including the Kansas City Southern, Missouri, Kansas & Texas, Missouri Pacific, St. Louis, Iron Mountain & Southern, Texas & Pacific, International & Great Northern, St. Louis Southwestern and St. Louis & San Francisco, he showed that the results of operations in 1914 were more disappointing than in the panic year of 1908. In the period 1908 to 1914, per mile of line owned, operating revenues increased about 32 per cent, while operating expenses increased 33 per cent, taxes increased 78 per cent, the operating ratio rose from 72.66 to 73.25, the ratio of funded debt to total capital rose from 63.69 to 70.51 and 59 per cent of the accumulated surplus was lost. The income available for return on the investment in 1914 was $1,958 per mile, equal to 7 per cent on a value of only $27,960 per mile. Seven per cent on the book cost would have been $4,047 per mile.

"Special consideration should be given to the necessities of the carriers in the Southwest," said Mr. Schaff. "There are special difficulties attached to railway operation in Missouri, Kansas, Arkansas, Oklahoma and Texas, which, perhaps, are not encountered in other sections of the country. In the Southwest we have no margin of safety. With us it has not been and is not a question of what is a reasonable dividend or a reasonable return on the capital invested, or what is a reasonable surplus over and above such reasonable return for the purpose of tiding the company through periods of depression and preserving the company's credit. With few and unimportant exceptions, the railroad companies in the Southwest have paid no dividends at all on their capital stock and have had no surplus funds. It has been and is a struggle for existence to pay operating expenses, taxes and interest on bonds and a little something more. Stockholders of the lines, both common and preferred, have during a long series of years received no returns from their investments, and earnings to which they were justly entitled were put back into the property, and nothing really has ever been earned on this new capital.

"Railroads operating in one or more of the five states which I have mentioned, having a total mileage of 11,079 miles, which includes the Wabash and the Frisco mileage east of the Mississippi river, and having a total capitalization of $624,000,000, were in receivers' hands on January 1, 1915. Of these receivership roads 8,641 miles were wholly within the five states, and approximately 20 per cent of the total railroad mileage in those states is now operated by the courts. And the lines of this group must pay or refund securities which mature during 1915, 1916 and 1917, aggregating $117,000,000. Construction of new lines of road in the Southwest has practically ceased and expenditures for additions and betterments, new equipment and facilities have been reduced to a minimum."

On cross-examination Mr. Thorne asked Mr. Schaff if he thought the public should pay 7 per cent on the investment represented by bonds as well as on the stock. Mr. Schaff said he thought 7 per cent ought to be earned on a fair valuation of the property used, even if it would give a much larger return on the stock, in order that a surplus could be accumulated in prosperous years to tide over the poor years. Mr. Thorne asked if the roads would be satisfied with increases in the rates involved in this hearing. "If it develops that the increase is not enough we ought to have further increases," said Mr. Schaff.

Luther M. Walter, attorney for Morris & Co., asked Mr. Schaff what directions he had given to his traffic department in regard to the increasing of rates. "I told them to secure an increase of rates wherever it was possible to do so," said Mr. Schaff, but he said that he had nothing to do with the selection of the commodities or the amount of the advance.

TESTIMONY OF S. M. FELTON

Mr. Felton said the western roads need an advance in revenue in order to be able to give proper service to the public and a fair return to investors and that the present net revenues have averaged during the last seven years only 7 per cent on less than $29,219 per mile. "It does not take a physical valuation to convince even a layman that this sum is far below not only the cost of reproducing the lines but below their value," he said. He believed that 7 per cent on the investment was only a reasonable return, because without any guarantee by the government, the returns should be considered on the basis that railroads are private companies. With the increased cost of operation and the increased cost of money, western roads have not been able to sell their stock or bonds at anything like the rates prevailing in former years, while the rates for their service have generally shown a decline. The trouble is not with gross earnings but with net, he said, and he believed the carriers have about exhausted the possibilities of economies in operation, at least such as could be effected without a very large investment.

"A good illustration of the expense of conducting our passenger business," said Mr. Felton, "is seen in the cost of the new terminal at Kansas City. There was a strong demand there for a new passenger station and one was needed. One could have been built on the old location for possibly two or three million dollars, but that would not have provided facilities far enough in the future and a better location must be had. The first estimates ran to about $15,000,000, but with the construction of the station came additional requirements for viaducts, subways, etc., and soon the estimate was $25,000,000. The final cost, I believe, will be close to $50,000,000. So far the interest, taxes and operating expenses will run from $1 to $2 per passenger handled in and out of the station for some of the smaller roads. The passenger business cannot stand these burdens without relief.

"What I have particularly tried to convey to the commission is the fact that general conditions in this territory are such that we must have not only the additional revenues which are provided by these advances but in some way still greater revenue must be received. Just what other commodities may be advanced I am not ready now to say and would not care to express an opinion. I know that for the roads which operate in the section of country where I am directly interested and that depend upon the rates in that territory for their earnings, there is an absolute necessity for more revenue, both from passenger and freight."

Mr. Felton said that it had been carefully estimated that the rates involved in this case would increase the revenues of the Great Western by about $325,000 a year. As an example of the difficulty of financing railroads at present, he said the bonds of the Kansas City Terminal Railway were guaranteed, both

principal and interest, by 12 roads, and at the last effort to issue bonds they could not be sold, but an offer was secured for one-year notes on a 7½ per cent basis. While the roads were considering this offer the rate was changed to 8 per cent last fall, and the money was finally raised by getting the roads interested in the terminal to advance it. Under the Illinois law, he said, the Great Western must get the permission of the Illinois Public Utilities Commission to issue bonds for improvements in Iowa and the commission fixes the price. He wanted to get some bonds into the treasury for future purposes and the company's 4 per cent bonds were selling at about 69. The commission consented to the roads taking them down from the trustee but fixed a minimum price of 73. The market is now at about 70 for these bonds, although the road is bonded for less than $25,000 a mile. The Great Western, he said, in five years has earned 7 per cent only on $23,050 per mile. In the best year of this period it earned 7 per cent on $29,096 and in the worst year on $18,352 per mile, and during that time over $17,000,000 has been expended on the property in cash. The new company since the reorganization has never paid a dividend and the stock and debenture holders of the old company, from whom the road was bought and who were required to put in $10,000,000, have never been given a cent of return.

Mr. Thorne cross-examined Mr. Felton in the effort to show that the credit of railroads was no worse than that of industrial concerns and public utility companies. Mr. Felton insisted that good securities of such companies could be placed on a much more favorable basis than those of the average railroad. Mr. Walter asked about meetings of the executive officers of the roads to discuss the rate advances and whether there had been any divergence of opinion as to the amount. Mr. Felton insisted that there had been no special meeting of the presidents on the matter; that the conferences were held by the traffic officers; he said he had talked the matter over with other executives since 1910 whenever he happened to meet them. Mr. Walter said that he had information which he wished to verify, that the railroads were not agreed as to the amount of the advance to be asked and decided to file maximum advances in order to "pass the buck to the commissioners." Mr. Felton said he knew of nothing of the kind, but that he personally thought that the advances were not enough, although some others did not agree with him.

TESTIMONY OF FESTUS J. WADE

Mr. Wade took the stand on Friday and said that no classes of securities have depreciated so much or are harder to sell than are railroad securities in the United States today. For the last two years bankers and investors have been obliged to turn elsewhere on account of the uncertainty and unreliability of the securities either as an investment or to buy for sale again to others. The present business depression, he said, was caused more by the "constant tirade" against the railways of the country, than anything else. Years ago, he said, it was common for bankers to put their subsidiary reserves in railroad securities.

Mr. Wade said that the commission had three distinct things to consider: First, that safety of life and limb and property shall be conserved; second, that labor shall be properly protected and paid, and third and equally important, that the financial interests and money invested in railways shall receive the same care and consideration as the others. Any attempt to decrease the value of money invested not only injures the railroads, the employees and the traveling public, but injures the republic as a whole.

It is practically impossible to finance a new railroad, he said. The decrease in market value of railroad securities from 1906 to 1914 was 20 per cent, equal to $3,000,000,000 or 75 per cent of the combined capital of all the banks and trust companies, state and national, in the United States. Mr. Wade presented a map of the West, showing in red the lines which already are in receivership, saying that from his own knowledge there would be more railways showing red lines in 1915 unless an increase in rates is secured. He said he knew personally that the Rock Island, Missouri Pacific, Missouri, Kansas & Texas and Missouri & North Arkansas, barely escaped receivership last year, even before the war, and he gave his experiences in the matter of financing a number of southwestern roads and the narrow margins by which several of them escaped bankruptcy by the decision of bankers to take the risk to tide them over. The holders of Wabash receivers' certificates, he said, were ordered by the court to renew them, and as the bankers saw no way to avoid it they did renew them at 7 per cent. The Frisco receivership certificates were renewed under practically the same conditions.

"We have bought railroad securities that ever since railroads were built were regarded as gilt-edged, and find that the public won't take them," he said. "When we buy securities for a year and find that we have to renew them at the order of a court we won't buy any more. They are not only shelf goods, but when the bank examiner comes around we have to mark off the depreciation, charging it to profit and loss."

Asked by Mr. Wright as to the comparative rates paid for money by railroads and other concerns, he said that never in the history of the nation has there been so much idle money as there is today. Large industries whose credit is good are being besieged to borrow for six to eight months at 4 per cent. In three months the federal reserve banks have not been able to lend enough money to pay their operating expenses, but with the exception of a few strong roads, railroad short-term paper cannot be marketed at anything like this rate. The market for railroad securities is "almost nil," he said, as far as the small investor is concerned, because he is scared. Banks have lost in nine years more than $125,000,000 by depreciation in railroad securities, and life and fire insurance companies have charged off more than $100,000,000 for this reason. For the same class of securities, he said, railroads have to pay from 50 to 75 per cent higher rates for money. When Mr. Wade referred to the activity of commissions as responsible for the poor credit of railways, Commissioner Daniels interrupted him sharply:

"Do you know that the commissions are responsible?" he asked. "Very largely so," replied the witness. "Then qualify your answer," said Mr. Daniels. Mr. Wade then excepted the Interstate Commerce Commission, and said that he believed railway regulation should be in the hands of one commission instead of the many state commissions.

Everett Jennings, counsel for the Illinois Public Utilities Commission, asked if the "avarice of stock and bondholders and manipulators in capitalizing blue sky and water" was not more responsible than the commissions for the conditions of the railways.

"It is just such wild statements as you have made just now that have hurt the credit of the roads," retorted Mr. Wade.

Some of the state commissioners tried to get Mr. Wade to say that the commissions have also done something to help the roads, and that the acts of railroad men were more responsible for their poor credit than those of the commissions. "It has never come to my attention that a legislature or state commission in this western country has ever voluntarily done anything to help the credit of a railroad," he said, "but they have often done things to impair it. I have seen no mismanagement in the Missouri, Kansas & Texas or the Missouri Pacific, yet I have seen their securities drop 5, 10, 15 and even 25 per cent." Asked if it was more profitable for a banker to do business with a weak railroad than with a strong road, he said the condition was just the reverse, that he had done business with some of these roads because they did business with him and because they were trying to develop the territory he was doing business in.

"Will it help the return of prosperity to tax shippers for the benefit of the railroads?" asked Mr. Walter. "Unquestionably," replied the witness. "As soon as railroads are accorded as fair treatment as banks and other business we will get prosperity and not before."

When some of the lawyers tried to show that the disclosures of mismanagement on some roads had been responsible for the

poor credit of railroads, Mr. Wade said that the disclosures of bad management on the part of roads that had been badly managed were a good thing, but that exaggerated and sensational statements given to newspapers had done harm.

Clifford Thorne led the witness into a long discussion of railroad credit, bankers' commissions, etc., and tried to show that some of the strong roads enjoyed better credit than industrials or utilities. Mr. Thorne referred to a list of seven roads. "You have picked out a galaxy of the strongest roads in the West," said Mr. Wade, "7 out of 41. There are other securities selling as favorably as those of the Burlington and the Atchison, but, like the Burlington and the Atchison, there are mighty few of them." Mr. Thorne several times insisted on "yes" or "no" answers. "But I don't wish to mislead you and the commission," said Mr. Wade. "You would have to understand the railroad bond business better to get it clear, and I see you don't." "How do you know I don't understand it?" said Mr. Thorne. "I can see by the way you talk," replied the witness. Mr. Wade said that isolated sales of securities, such as Mr. Thorne quoted from a newspaper, are no criterion of a railroad's credit, and that it is impossible to tell from advertisements of bond sales what the railroads get. Bankers' commissions, he said, depend on a number of conditions. "You can't sell a bond just by having it," he said. "You have to have men employed to sell it, and what you have to pay depends on a large number of conditions in each case."

TESTIMONY OF B. F. BUSH.

Mr. Bush testified in part as follows:

"A most grave situation confronts this country in its transportation affairs. The problem has ceased to be one, with many of the roads, as to how returns can be realized for the shareholders, as this has largely passed beyond redemption. It is one rather as to how the integrity of the security can be maintained, as to how the interest on the mortgage bonds can be met. We believe the bad economic conditions which have prevailed for the past 18 months with the attendant depression of general business, have been due more to the railroads not earning adequate revenues than to any other cause. Nine industries in St. Louis dependent on railroads have been obliged to curtail their forces some 10,000 men, and their payrolls on that account are $588,000 less per month than in times of normal business. The loss in wages of the employees of these nine St. Louis district industries would aggregate over $7,000,000 a year.

"The time has come when it is most vital not only to the carriers' interests but to the industrial and commercial welfare of the country that the desired advances should be allowed. I fail to see why the investor in railroads, which are all-important to every trade and industry, should not be allowed a return commensurate with that of the investor in other enterprises. Seven per cent should not be deemed an excessive amount for roads to earn on their value. Very few of them can now get money at less than that figure. The last census shows that the capital of manufacturers increased in 10 years over $9,000,000,000 and, notwithstanding this large increase, 105 per cent, the return to the owners was over 12 per cent.

"In the Southwest there was an aggregate for the past seven years of nearly $3,000,000,000 of railroad securities that received no return. The necessity of immediate help to these carriers is further emphasized by their depleted earnings for the first six months of this fiscal year.

"Tonnage and passengers carried and the revenue therefrom show substantial increase, but the gains are more than offset by the increased expenses which are largely beyond the power of the management to control. Federal, state and municipal enactments during the last 10 years have greatly increased railway expenses. The higher standards of service demanded by the public have necessitated a greater outlay of funds. Organized labor has made repeated demands for higher wages, sanctioned by arbitration boards.

"In the meantime the unit of compensation received for service has been lowered considerably, further increasing the railroads' burdens, so that were it not for the marked progress in greater efficiency of operating methods the railroads would have long since met with bankrupt disaster.

"When one considers the great forward steps in increasing the number of tons and passengers per train, one would think the railroads were progressing towards more and more prosperous conditions. But the facts are that the uncontrollable increase in expenses and taxes and the gradual reduction of rates have more than absorbed the gains derived from greater efficiency.

"Twenty-six of the carriers in this proceeding have over $100,000,000 securities maturing this year, and 24 have over $55,000,000 which mature next year. In the next seven years over $422,000,000 of obligations will have to be refinanced by 34 of the companies now before you. The most serious consequences are threatened to the railroad world by these maturing obligations unless something happens to change the present unfavorable conditions with which they are confronted."

Mr. Bush said that when the roads tried to sell bonds for the Memphis bridge across the Mississippi river, which were guaranteed by the Chicago, Rock Island & Pacific, St. Louis, Iron Mountain & Southern and St. Louis Southwestern, they couldn't get a bid for 6 per cent bonds and were finally compelled to sell short-term notes. Speaking of the increased cost of maintenance, he said that whenever these western roads spend less than $1,200 a mile for maintenance of way and structures they are borrowing from the future, and until the old equipment which prevails on a number of western roads is used up they can't show much saving in maintenance of equipment and must probably look for an increase.

TESTIMONY OF J. W. LUSK

Mr. Lusk testified on Saturday. He said he had been a lawyer and a banker all his life and had no interest in any of these railroads, but had become one of the receivers of the St. Louis & San Francisco at the request of Judge Sanborn after he had retired from active business. He found the Frisco with "no money to speak of" and $2,500,000 of preferred claims. The court had authorized the issuance of $3,000,000 receivers' certificates to meet these claims and to pay equipment notes, and they were placed at 6 per cent and 1 per cent commission. The court declined to authorize certificates, however, to meet interest payments on $143,767,266 of bonds and notes, and they were defaulted for lack of earnings and because there was no prospect of getting money out of operation to pay with. Up to date he had been able to pay out of earnings after operating expenses and taxes only the interest on the balance of $92,557,500 of bonds, out of a total of $236,000,000. The total represents only the bonds of the Frisco proper, he said, concerning which no question had ever been raised. The interest paid on $92,557,500 of underlying securities amounts to $4,307,045, and the interest not paid amounts to $6,560,000. "All we can pay on with our earnings after operating expenses and taxes," he said, "represents a little less than one-half of what the railroad is assessed for and is equal to only 1.7 per cent on $50,000 a mile, the lowest estimate of the value of the Frisco, which is a well located road in a fine territory.

The receivers' certificates were renewed, after a year with great difficulty, he said, on the promise that no more would be issued. The receivers had tried to spend enough on maintenance to keep the road safe, but they had not been able to make improvements. The equipment notes had been paid because they would lose the equipment otherwise.

On cross-examination by Mr. Thorne, Mr. Lusk said he had no knowledge of the financial operations before the receivership, whereupon Mr. Thorne asked that the record in the Interstate Commerce Commission's investigation of the road be made a part of the record in this case. Commissioner Daniels deferred ruling on this request.

Mr. Daniels asked if it would be possible to compile statistics fairly reflecting the comparative credit of railroads and industrial concerns or public utilities. "You can pick out good and bad ones on both sides," replied the witness. "You might be able

to get a fairly accurate comparison of averages, but every one knows the railroads are under the weather today. Everyone knows that, no matter how you say it came about or for what reason, it is a fact. The railroads, to use a slang expression, are 'in the soup.' You can lay it to the European war or anything else, but the railroads are down. And yet the country is full of good crops and high prices. It is a remarkable state of affairs."

Mr. Thorne asked if his opinion was based on investigation or was only an impression. "Of course anybody can see that a two-cent fare isn't right in the southwest," said Mr. Lusk. "Then you disagee with the Minnesota railroad commission and the Supreme Court?" "The Supreme Court never said two cents was enough," replied Mr. Lusk. "It said the railroads hadn't proved it was too low."

"Railroad regulation and control has come to stay. The man who don't know that is pretty blind. But that power ought to be handled with care not to strangle the railroads," he said, turning toward the table where sat the state commissioners. "I have known bankers who have gone wrong and they have been sent to jail. There have been colonies of them in the penitentiaries, but the banks were not attacked. I haven't heard of any railroad looters going to jail. You are not hurting them. You are hurting the railroads, and innocent stock and bondholders and employees and the business men who sell supplies to railroads.

"We have turned off 1,456 employees since July because we couldn't afford to keep them. That's why I think there hasn't been enough care on the part of the state commissions in cutting down rates. You ought to allow them enough to pay their honest debts."

"Does not the constant reiteration by railroad presidents that the roads are in bad shape tend to hurt their credit?" asked Attorney Walter.

"Well, now, I think that's where the railroad presidents have made a bad mistake," said Mr. Lusk. "I agree with you," interrupted Mr. Walter. "They haven't half told how bad it was," continued the witness. "They are always nervous about hurting their securities, and many of them are afraid to speak out."

STATISTICAL EXHIBITS

On Saturday the introduction of testimony was begun by Julius H. Parmalee, statistician of the Bureau of Railway Economics, who presented 16 exhibits compiled from the reports to the Interstate Commerce Commission, giving figures for all of the roads in the western district. He was followed by L. E. Wettling, accountant for the roads, who presented 80 exhibits, also based mainly on reports to the Interstate Commerce Commission, showing operations of the 41 railroad systems, operating 98,446 miles in Western Trunk Line and Southwestern territory, involved in this case, for the years from 1901 to 1914 inclusive, comparing the period 1901 to 1907 with that from 1908 to 1914. Figures were given for the combined operations of the 41 systems, representing 61 roads that report to the commission, and for the separate groups as outlined by Mr. Wright. Mr. Wettling said that the periods and groupings had been selected before any compilations were made and that all of the basic figures were given for each road so that they could be grouped in any manner desired or for any period. Some of the principal comparative figures were outlined in Mr. Schaff's testimony.

An interesting summary of the comparative results in the two periods was given in two exhibits, reproduced herewith, showing that net operating income per mile operated of the 41 systems was $153.14 less for the seven years 1908-1914 than for the preceding seven-year period and for each dollar of road and equipment cost the net operating income had decreased .77 cent, or 15.52 per cent, while the total operating revenues per dollar increased 7.29 per cent. For Group 1, including 10 of the leading systems in Western Trunk Line territory, net operating income decreased $105.70 per mile for the second period as compared with the first, and per dollar of road and equipment cost decreased .95 cent, or 16.35 per cent. For Group 2, including the six roads operating over 1,000 miles exclusively in Western Trunk Line territory, the decrease in net operating income per mile was $421.27 and for each dollar of road and equipment cost was 1.08 cents, or 27.14 per cent. For Group 3, including 10 of the leading systems in Southwestern territory, the decrease per mile was $94.19 and per dollar of road and equipment cost was .46 cent, or 9.87 per cent, while for Group 4, including the seven roads operating over 1,000 miles exclusively in that territory, the decrease per mile was $240.27 and per dollar of road and equipment cost was .56 cent, or 14.32 per cent.

From 1901 to 1914, the exhibits showed, the net cost of road and equipment for the 41 systems increased 68.99 per cent, while operating revenues increased from $449,665,388 to $912,300,041, or 102.88 per cent, the ratio of operating revenues to cost of road and equipment from 14.96 per cent to 17.96 per cent, operating expenses from $306,383,445 to $710,013,578, or 134.68 per cent, the operating ratio from 68.14 to 78.81 per cent, while net operating income from $143,281,943 to $193,286,463, or 34.9 per cent.

The ton-miles per mile of road for the first period averaged 613,059 per year, an increase of 10.31 per cent over 1901, while for the second period the average was 709,889, an increase of 27.74 per cent over 1901. Passenger miles per mile of road for the first period averaged 78,076, an increase of 20.30 per cent over 1901, and for the second period the average was 103,959, an increase of 60.18 per cent over 1901. The average freight rate per ton-mile declined from 8.64 mills in 1901 to 8.27 in 1914. For the first period it averaged 8.55 and for the second period 8.46. The average revenue per passenger mile decreased from 2.16 cents in 1901 and an average of 2.12 for the first period, to 2.05 in 1914 and 2.03 for the second period, an average of 2.06 for the 14 years. The average tons per train mile for the first period was 266.78 and for the second 316.54, while the average tons per car mile increased from 10.84 to 11.51. The average number of passengers per train mile increased from 42.37 to 51.37 and per car mile from 8.44 to 9.69. From 1901 to 1914 the average freight train load increased from 229 to 364 tons.

Exhibits 15, 16 and 17, devoted to increased labor costs, showed a steady increase in the average daily compensation, including general officers, from $1.99 in 1900 to $2.51 in 1914, which was an increase of 26.1 per cent, the average for the first period being $2.11 and for the second $2.39. Excluding general officers, the increase was from $1.95 in 1900 to $2.48 in 1914, or 27.2 per cent. the average for the first period being $2.07 and for the second $2.36. The average for the period 1908 to 1914 was 13.3 per cent greater than for the preceding period including officers, and 14 per cent greater excluding them. Between 1900 and 1914, on the basis of the 1900 scale of wages, these carriers paid out, exclusive of general officers' salaries, $526,355,000 more for labor than they would have paid had the 1900 scale of wages been maintained. For 1914 alone this increase amounted to $85,167,085.

Of each dollar of revenue 38.25 cents was paid for labor in 1901 and 44.28 in 1914, while taxes consumed 3.20 cents out of each dollar in 1901 and 4.60 in 1914. For both labor and taxes the increase from 1901 to 1914 was 18.16 per cent. One table showed that if taxes had been paid in 1914 at the 1901 rate the roads would have saved in that year $17,628,142, or $179 per mile. and if labor had been paid at the 1900 rate they would have saved $865.11 per mile. The combined increase in labor and taxes on this basis was $102,695,000, or $1,044 per mile, 2.02 per cent of the net cost of road and equipment in 1914.

Another exhibit showed that while the cost of road and equipment per dollar of revenue decreased from $5.93 to $5.53 in the two periods and the capital stock per dollar of revenue decreased from $2.71 to $2.34, the interest paid per dollar of revenue increased from 14.69 cents to 15.01 cents, the balance available for dividends and surplus decreased from 14.76 cents to 8.19 cents and the percentage of dividends and surplus combined to stock decrease from 5.45 per cent to 3.50 per cent; and was 2.73 per cent in 1914. The percentage of total maintenance expenses to operating revenue increased from 26.69 to 29.24 in the two periods, and the percentage to cost of road and equipment increased from

4.50 to 5.29, while the average per track mile increased from $1,521 to $1,886. The increase for maintenance of way and structures was from $807.36 to $898.77 and for maintenance of equipment from $714 to $987 per mile operated.

The net cost of road and equipment per mile of line operated increased in the two periods from $44,304 to $48,775 and for 1914 was $51,584.

Exhibit 27 showed the expenditures for additions and betterments for seven years by 41 systems, classified by roads and by Interstate Commerce Commission accounts, making a total of $433,507,867 for road and general expense and $306,181,596 for equipment, $739,689,463 in all.

The total capitalization of the 41 roads in 1914 was $5,366,390,231. This compares with $5,078,293,153 for the net cost of road and equipment. The increase of capitalization over 1901 was $2,250,570,854. Of the total, 62.26 per cent was funded and other debt and 37.74 per cent stock in 1914 as compared with 53.67 and 46.33 per cent in 1901.

Exhibit 29 showed the requirements in the next seven years for refunding or financing maturing obligations now outstanding for 34 operating systems, a total of $422,822,251, of which $100,748,897 represents maturities in 1915.

DIVISION OF OPERATING EXPENSES

Exhibits 30a and 30b gave a division of operating expenses as between freight and passenger service for the 41 roads for the year 1914, compiled on six different bases, showing the percentage of net operating income in each class of service to the cost of road and equipment, dividing the operating income and the cost of road and equipment on the basis of the division of expenses. While the total percentage of return was 3.81, the percentage of operating expenses assigned to freight according to the different bases ranged from 67.06 to 68.70, while that assigned to passenger service ranged from 31.20 to 32.94. Of the operating revenues 70.33 per cent was from freight service and 29.67 from passenger service. The ratio of expense to revenue, which was 78.81 for the total, ranged from 75.14 to 76.98 for freight and from 83.17 to 87.52 for passenger service.

Statistics similar to those given in the exhibits for the 41 roads were also given for the four groups previously mentioned.

STATISTICS FOR ALL WESTERN ROADS

The exhibits compiled by the Bureau of Railway Economics and presented by Mr. Parmalee covered the operations of roads operating 130,889 miles in 1914. Exhibit 1 showed that comparing 1914 with 1908 the mileage had increased 11.88 per cent and operating revenues 12.48 per cent per mile, operating expenses had increased 14.41 per cent, net operating revenue 8.43 per cent, taxes increased 58.69 per cent, and operating income only 1.54 per cent. Interest on funded debt increased 19.63 per cent, net income decreased 28.66 per cent, and dividends declared out of income decreased 72.48 per cent on preferred stock and 25.23 on common stock. Appropriations out of income for additions and betterments increased 38.95 per cent, dividends declared out of surplus increased 22.9 per cent and the surplus for the year decreased 5.57 per cent. The ratio of operating income to net property investment in the seven years 1908 to 1914 was 4.88, 5.33, 5.22, 4.86, 4.35, 5.02 and 4.39.

Mr. Wettling was cross-examined on his exhibits by Mr. Thorne, Mr. Walter, Mr. Helm and Mr. Lamb. Mr. Thorne demanded that Mr. Wettling furnish the working sheets from which the exhibits were compiled in order that he might get certain information as to cost of road and equipment and capitalization, which he said the witness had not included for some of the roads in the group statistics. Mr. Wright at once offered to allow Mr. Thorne's assistants to copy any or all of the sheets desired. Mr. Thorne also asked for a compilation of additions and betterments charged to operating expenses, saying he thought that would result in one of the most important parts of the investigation.

E. B. Boyd, chairman of the Western Trunk Line Committee, took the stand on Tuesday and testified regarding the advances in the rates on grain and grain products.

VALUATION CIRCULARS

Secretary Thomas W. Hulme, of the Presidents' Conference Committee for the Federal Valuation of Railways, has issued two circulars dated March 1, one being a general statement of the development in the valuation work during January and February, and the other a communication with reference to the commission's order No. 7 relative to land appraisal.

In the general statement the attention of the railroads is called to the fact that the commission has adopted sample forms for reporting extensions and additions and betterments, for use in reporting improvements made after the federal forces have started their valuations. The valuation department does not, however, desire the roads to fill out such reports until their properties are under valuation.

The commission now has under consideration the issuance of orders requiring the carriers to report:

(a) Certain classes of leases;

(b) A vast amount of detail information as to prices of labor and material;

(c) Information in connection with land grants, aids, gifts, donations and concessions as required by the fifth section of the valuation act;

(d) A schedule of industrial side tracks;

(e) Inventory of records, such as minute books, treasurer's books, account books, etc.;

(f) Preparation of inventories by the carriers when so directed by the director of valuation.*

The attention of the carriers is also called to the fact that valuation order No. 9, referring to a special rate for the transportation of the cars used to house and maintain the government engineers, applies only to the movement of those cars on the lines of a carrier under valuation and then only for short distances while actually engaged in making the surveys.

To facilitate the progress of the bridge, telegraph and telephone and other federal parties, the carriers are urged to furnish motor car service where the safety of operation will permit, for which the government is willing to pay a reasonable compensation. This is already being done on a number of roads now under valuation.

The following roads have advised that they have received notice that their properties will be valued as of the dates indicated:

Ann Arbor	June 30, 1915
Atchison, Topeka & Santa Fe (Grand Canyon Line in Arizona)	during winter of 1914-15
Cincinnati, Hamilton & Dayton	date not fixed
Georgia, Southern & Florida	June 30, 1915
Maine Central	June 30, 1916
Nashville, Chattanooga & St. Louis	July 1, 1916
New York, New Haven & Hartford	June 30, 1915
Pennsylvania Railroad—	
Lines South of Philadelphia	June 30, 1915
Lines in state of New Jersey	June 30, 1916
Northern Central Ry. and subsidiaries	June 30, 1916
St. Louis Southwestern	June 30, 1915
Savannah & Northwestern	June 30, 1915
Southern	June 30, 1916

A conference will be held on March 22, between the representatives of the division of valuation, the state commissioners and the railroad companies for the consideration of a number of fundamental questions which it is now necessary to settle, as the preliminary reports are practically ready for submission to the commission on the valuation of the Atlanta, Birmingham & Atlantic; the Norfolk Southern, the Texas Midland, the New Orleans, Texas & New Mexico, and portions if not all of the lines of the San Pedro, Los Angeles & Salt Lake. Among the important questions which will be considered are the following: The form and manner in which the reports shall be presented to the commission and to Congress and the detail to be included; to what extent in determining "cost of reproduction new" reference shall be had to conditions as they existed at the time of the original construction with reference to clearing and grubbing, improvements on the property, the existence of present transportation facilities, etc.; what overhead charges shall be allowed and in what amount; the allowance to be made for appreciation; how depreciation is to be determined; how unit prices

*See Order No. 13 reprinted in our news columns.

shall be determined; how "the present value" of land used for transportation purposes is to be determined; whether or not, when the original cost cannot be shown from the books of the railroad, an estimate shall be made; whether the commission shall distribute the value of equipment between several states, and if so upon what basis; whether the value of an important terminal like the Pennsylvania station in New York shall be distributed, and if so upon what basis; what "other value and elements of value" shall be allowed for, and whether allowance shall be made for "going values," franchises, favorable locations, earning capacity, etc.

The second circular discusses the purposes of valuation order No. 7, requiring the scheduling of the lands of the different railroads and the director's instructions to the supervisor of land appraisals. It calls attention to the distinctions between land in use, land held for future use and land not held for future use; with a discussion of the manner in which each class should be handled for the purposes of valuation.

ANTI-FULL-CREW LAW CAMPAIGN

R. L. O'Donnel, chairman of the Executive Committee of the Associated Railroads of Pennsylvania and New Jersey, says that the farmers in the southern corners of Chester and Lancaster counties, Pennsylvania, are up in arms against the excess man crew law. They see the absurdity of the workings of this law. About six months ago some forty of the richer farmers of this section bought the Lancaster, Oxford & Southern Railway for $40,000. This is a little railroad with 28 miles of line. It provides the only transportation service through a country with about 2,500 population. There is not much traffic on the road; only two or three trains a day, each of which carries one passenger coach and two to five cars of freight. Under the law each train, even if made up of only two cars, must have a crew of five men; an unwarranted expense for so poor a road.

Mr. O'Donnel calls attention to the fact that the $2,000,000 a year now paid in wages to superfluous brakemen by the railroads of Pennsylvania and New Jersey, if used in purchase of 80 locomotives, would give employment for a year to 1,745 men. Of these, 894 would be in the locomotive shops. The other 851 would get employment in steel mills, at iron furnaces and brass foundries, in mining coal and manufacturing coke, in mining iron and in other lines of activity.

Should the $2,000,000 be expended in purchase of 2,000 freight cars, employment for a year would be furnished to 1,489 men; or to purchase 200 steel passenger cars, a year's work for 1,708 men.

Possibly the strongest argument that is being put forth by the railroads is that if they undermanned their trains they would be the heaviest sufferers. A freight train of one locomotive at $25,000 and 75 cars at $1,000 each would represent $100,000 in rolling stock. Is it reasonable to assume that a railroad would jeopardize the safety of that great capital investment to save $2.75, the wage of an extra brakeman?

Mr. O'Donnel calls attention to the fact that in the passenger service as many as twenty men, including the dining car crews, are on some trains. These dining car men could be requisitioned into outside service in emergency. On the Pennsylvania Railroad's "St. Louis Express," comprising eight cars, there are six railroad trainmen and a Pullman crew of six, making twelve. The "Lackawanna Limited" of eight cars carries six railroad trainmen and five Pullman men. The "Royal Limited," operated by the Baltimore & Ohio and the Reading with six cars, is crewed with six railroad and four Pullman men.

The railroad contention is that four men outside of the engine are not required to safely and efficiently operate such trains as the following: The Reading coal train running through without stops, except for water, from Bridgeport to Port Reading, on New York harbor; the Pennsylvania Railroad fast freight running on schedule from Harrisburg to Philadelphia, and the New Jersey Central fast freight from Jersey City to Allentown. These trains average about thirty-five cars. The point is made that the work to be done in connection with the operation of these trains is virtually nothing during their runs. These trains run entirely under control of block signals and interlocked switches.

Public sentiment as expressed by the newspapers overwhelmingly favors repeal of the "excess man crew" laws. Editorials to the number of 199 have so far come to the attention of the committee. They group the newspapers on the proposition as follows:

For repeal	162
Against repeal	10
Neutral	27

From Harrisburg it is reported that members of the legislature have received literally thousands of letters, aside from petitions signed by great numbers of people, urging them to take quick action for repeal of this law.

The Westinghouse Air Brake Company has made a statement in reply to assertions of trainmen's representatives at Harrisburg that the excess man on freight trains is necessary because long trains cannot be successfully and safely handled by air brakes, calling attention to the fact that traffic is handled successfully every day in all parts of this country in train units of 100 cars and more. Some senators and representatives, seeking to be intelligently informed, have had the workings of air brakes demonstrated to them.

Figures have been prepared which show what it costs to carry an unnecessary man on a train. For example, the excess man on the Broadway Limited, the fastest train over the Pennsylvania between New York and Chicago, makes an added operating cost of $2,566 a year for that part of its run between New York and Pittsburgh. That amount is the wages at $7.03 for each trip. At no time does this high speed, virtually no-stop train, have less than nine men on it, not counting the engineer and fireman. Between New York and Pittsburgh it makes only three stops. Very rarely does any member of the train crew have to leave one of these through trains except at the regular stops, and there, with assistance of the Pullman men, only to see passengers get on and off in comfort. Since the laws became effective in Pennsylvania a total of $4,842,801 has been paid for the superfluous men, and in New Jersey, where the law became effective May 1, 1913, $642,676 has been paid, making a total in the two states of $5,485,477.

In Pennsylvania resolutions for repeal have been adopted by the Philadelphia Bourse, the Pittsburgh Chamber of Commerce, the Commercial Club of that city, which has a membership of 1,100; the Philadelphia Milk Exchange and by farmers' organizations of Union county and other parts of the state. A referendum vote on the proposition being taken by the Williamsport Board of Trade has so far resulted 155 to 6 in favor of repeal.

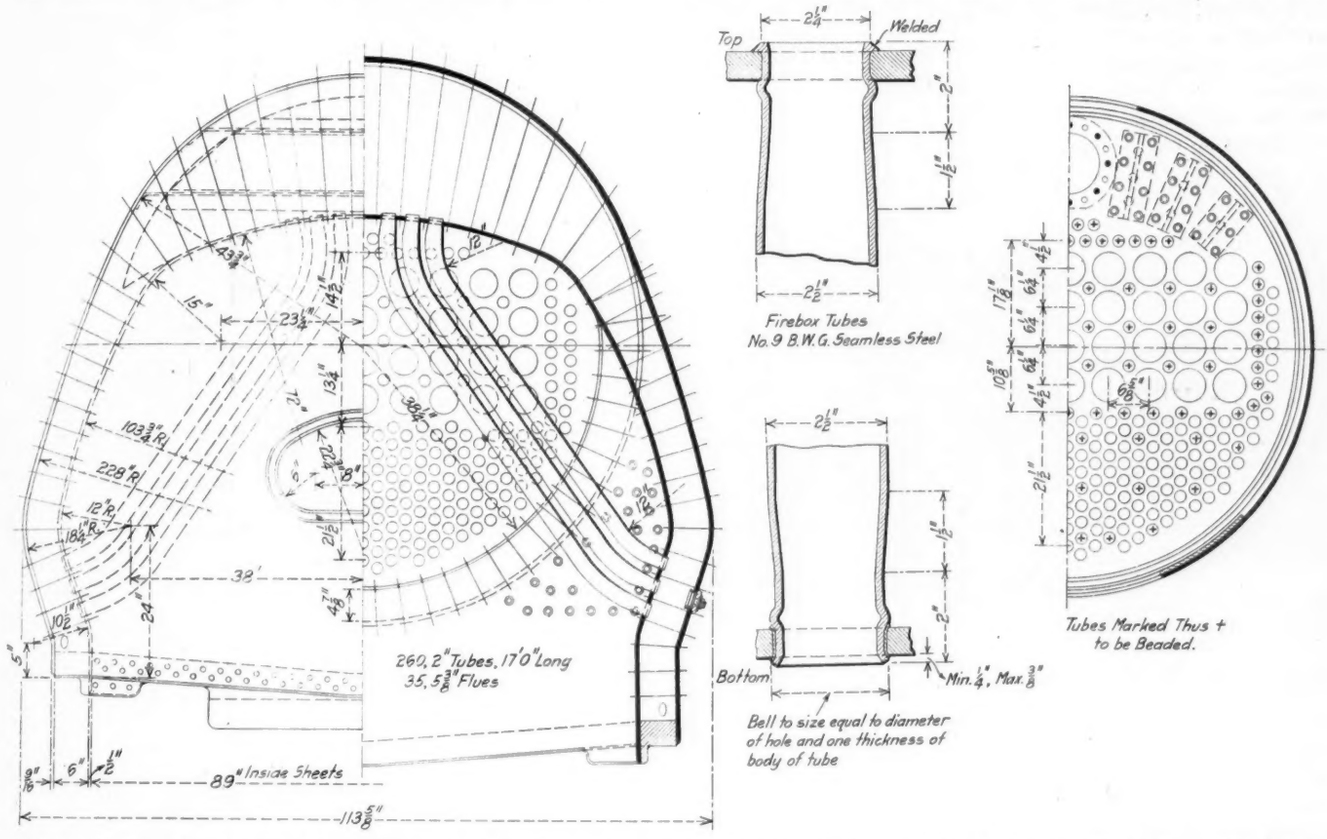
In New Jersey emphatic action has been taken for repeal by resolutions passed by boards of trade and chambers of commerce in such chief cities as Newark, Paterson, Passaic, Jersey City and Trenton; and the committee announces that, with the active support of chambers of commerce, the railroads have caused to be introduced at Trenton a bill to repeal the New Jersey law. This bill contains a proviso giving the State Public Utilities commissioners full power to determine the number of trainmen or other men to be hired to operate passenger trains composed of more than three cars and freight trains composed of more than six cars.

The presidents of the ten principal railroads in the state of New York have presented to the legislature a protest against the full crew law of the state, and asking the legislators to support Senator Conkling's bill, now under discussion, to repeal the present statute. The railroads declare that the burden imposed on them by the full crew law in New York has amounted to $1,170,000 a year.

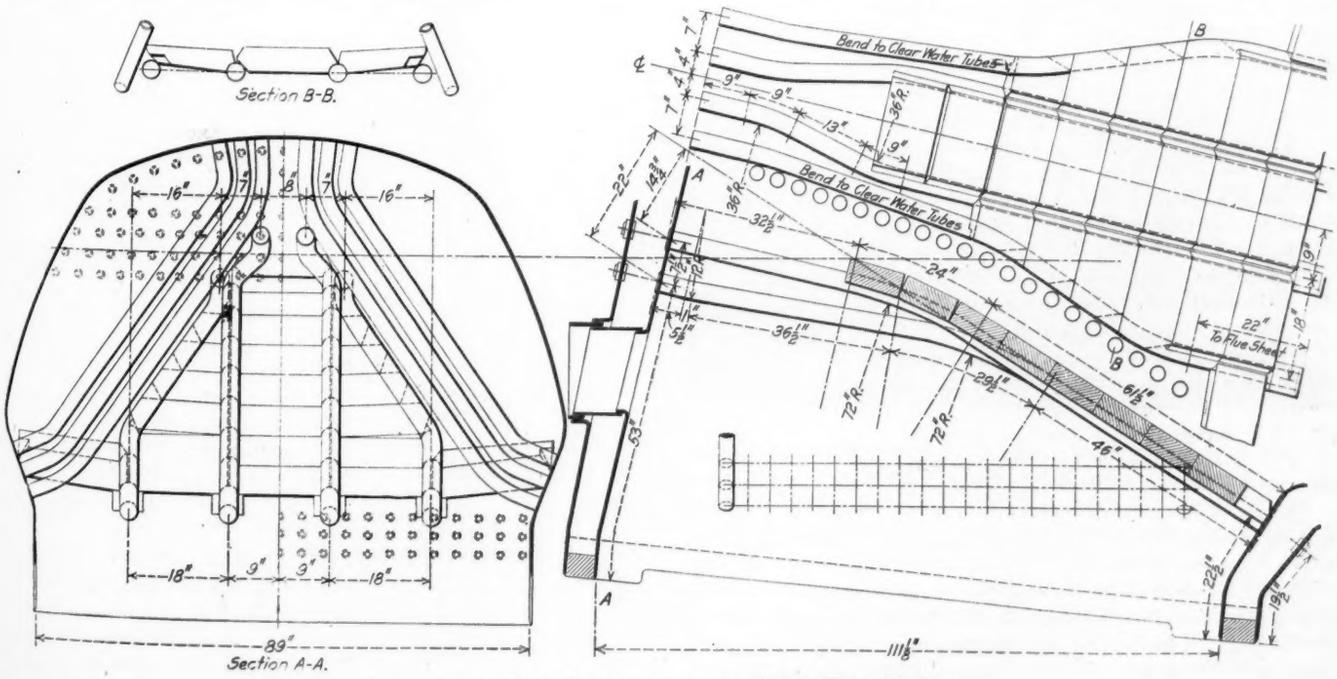
LACKAWANNA LOCOMOTIVE WITH WATER TUBE FIREBOX

In December last the Delaware, Lackawanna & Western received from the Lima Locomotive Corporation a Pacific type locomotive similar to those described on page 657 of the *Railway Age Gazette* for October 9, 1914, but equipped with a special type of firebox, patented by S. S. Riegel, mechanical engineer of the Lackawanna.

Reference to the drawings will show the construction in detail. As will be seen there are two nests of water tubes with 66 2½ in. outside diameter tubes in each. The cross section of the firebox shows the shape to which the side sheet is bent in order to permit a satisfactory connection between it and the lower ends of these water tubes, the bottom row of which is about 15 in. above the mud ring at the front end. The tubes are spaced at 4 in. centers and swing upward across the firebox space to the crown sheet, in which the ends are inserted. Plugs for cleaning purposes are placed opposite the ends of the tubes in the outer shell sheets, both top and bottom. The method of securing a tight


Top
Welded
Firebox Tubes
No. 9 B.W.G. Seamless Steel
Bottom
Min. 1/4", Max. 3/8"
Bell to size equal to diameter of hole and one thickness of body of tube
Tubes Marked Thus + to be Beaded.
260, 2" Tubes, 17'0" Long
35, 5 3/8" Flues
89" Inside Sheets
113 5/8"

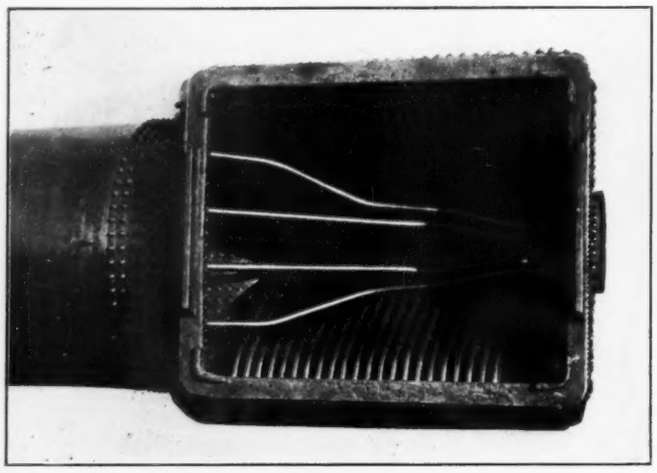
Cross Section Showing the Arrangement of the Tubes in the Firebox; in This Engine the Tubes Are Not Welded as Indicated



Arrangement of the Brick Arch in the Water Tube Firebox

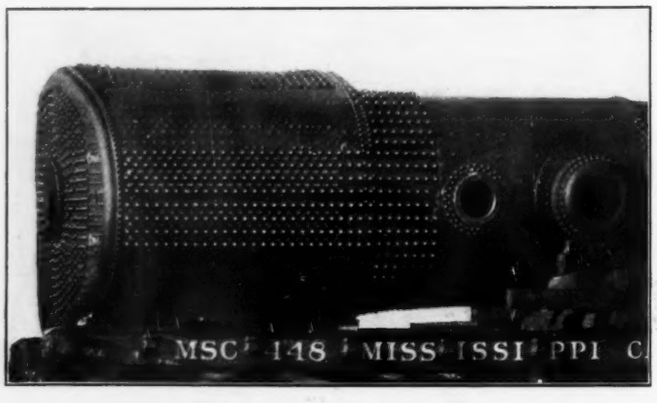
joint in the two sheets is shown in the drawing of the boiler cross sections, but in this instance the water tubes are not welded in as shown on the drawing. Instead they are prossered, belled and beaded and set without ferrules in the top sheet, while the bottom ends are set with a ferrule, prossered, expanded and belled. These tubes are made of seamless soft steel, tested to 2,000 lb. per sq. in. hydraulic pressure before application.

These water tubes give a heating surface of 471 sq. ft., the total heating surface of the boiler being 494 sq. ft. greater than that of other locomotives of the same class. The total heating surface for the engine with the experimental boiler is 3,960 sq. ft., while that of the sister locomotives is 3,466 sq. ft.; this does not include the superheater surface of 740 sq. ft. In the experimental engine the heating surface of the firebox and combustion chamber is 288 sq. ft., while that of the engines of the same class is 267 sq. ft.; the tube heating surface for the experimental engine is 3,177 sq. ft., the same as that of the sister engines. A special application of the Security brick arch was made to the water tube firebox.

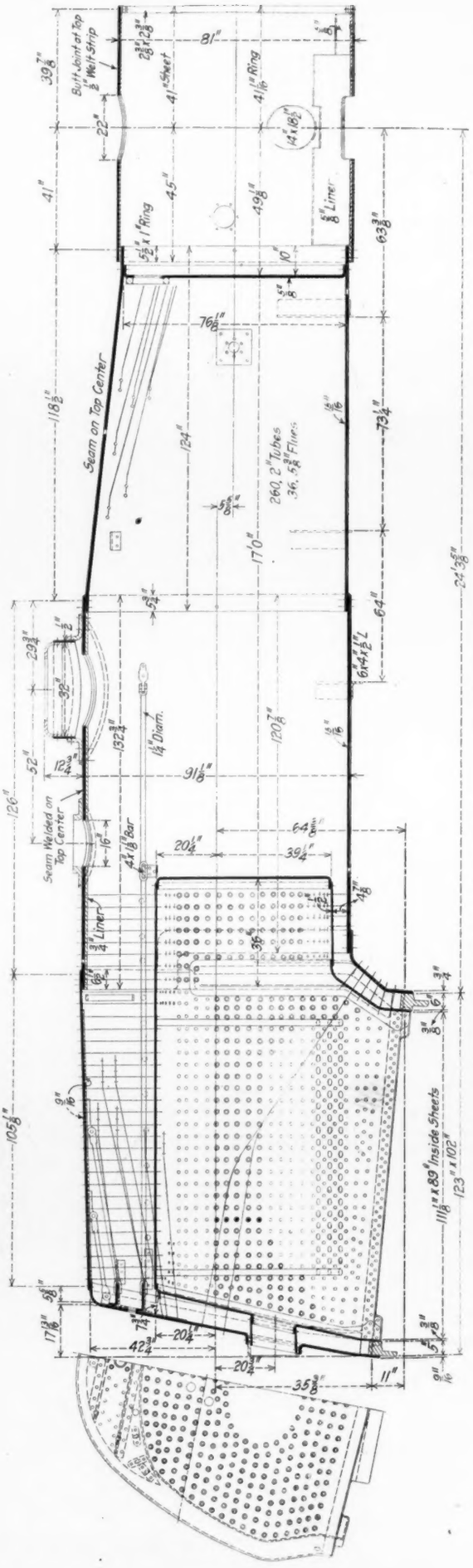


Interior of the Firebox Showing the Water Tubes and Arch Tubes

The object of the water tube construction was to obtain an improved circulation by providing definite cycles of circulation through these tubes in the zones of greatest heat intensity as well as to locate the heating surfaces to greatest advantage. While the locomotive has not so far been in service long enough to permit of any definite results being obtained, the performance has been so satisfactory with both bituminous and anthracite coal that the Lackawanna is ordering another engine fitted with this boiler, for use exclusively in fast passenger service. Considerable valuable information has been obtained showing its performance in comparison with the sister engines, and it is be-



Firebox Showing the Plugs in the Roof Sheet Opposite the Upper Ends of the Water Tubes

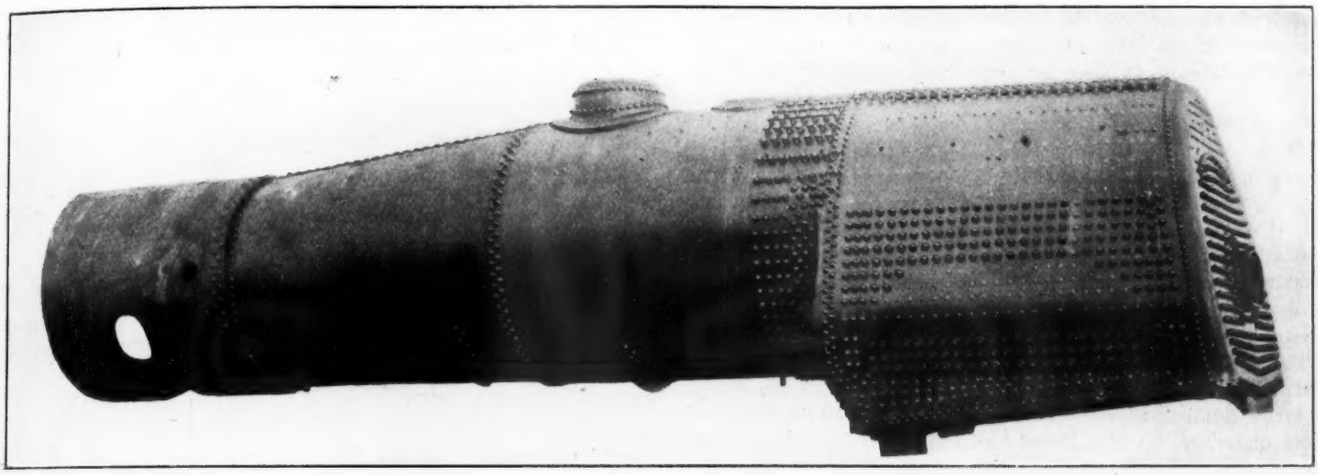


Water Tube Boiler of the Lackawanna Pacific Type Locomotive

lieved that this type of boiler will be an entire success. Further tests are being conducted, and it is expected at a later date that interesting performance data will be available. While some of the data given in this article may differ from other published accounts, it is official and authentic.

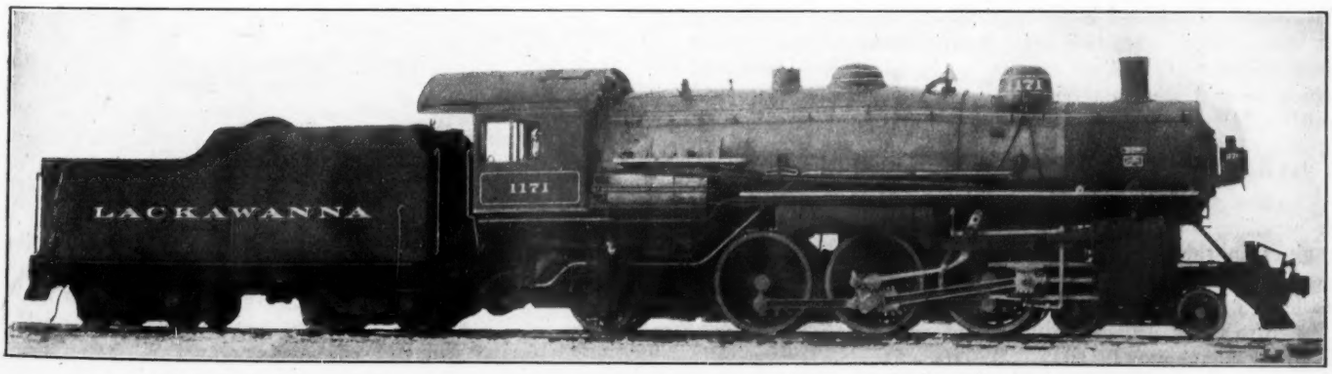
A few of the principal dimensions are given in the following table:

Class	4-6-2
Gage	4 ft. 8½ in.
Diameter of driving wheels	69 in.
Tractive effort	43,200 lb.



The Water Tube Boiler of the Lackawanna Pacific Type Locomotive

Cylinders	25 in. by 28 in.
Weight on leading truck	50,000 lb.
Weight on drivers	189,600 lb.
Weight on trailing truck	58,000 lb.
Total weight of engine in working order	297,600 lb.
Coal capacity of tender	10 tons
Water capacity of tender	9,000 gal.
Total weight of tender loaded	165,500 lb.
Total weight of engine and tender	463,000 lb.
Rigid wheel base	13 ft.
Wheel base of engine	33 ft. 10 in.
Wheel base, engine and tender	66 ft. 4 in.
Boiler pressure	200 lb.
Grate area	69 sq. ft.
Diameter of boiler	78 in.
Firebox	89 in. by 111 in.



Pacific Type Locomotive on the Lackawanna, Fitted with a Boiler Which Has a Water Tube Firebox

Factor of adhesion	4.39
Water tubes, diam., gage and length, 2½ in., O. D.; seamless steel; No. 9; 6 ft. average	
Heating surface, firebox and combustion chamber	288 sq. ft.
Heating surface, water tubes	471 sq. ft.
Heating surface, fire tubes	3,177 sq. ft.
Heating surface, arch tubes	24 sq. ft.
Total heating surface of firebox	783 sq. ft.
Total heating surface	3,960 sq. ft.
Superheater heating surface	740 sq. ft.

EXCAVATING ON THE PANAMA CANAL.—During January a total of 1,163,255 cu. yd. of excavating was done on the Panama canal—15,922 yd. by dry excavation and 1,147,333 yd. by wet excavation. To February 1, 1915, the total canal excavation by Americans was 230,262,028 cu. yd.

WAR BONUS FOR ENGLISH RAILWAYMEN

A large proportion of the conciliation board settlements between the English railways and their "wage-earning employees engaged in the manipulation of traffic," would have terminated on or about January 1. The National Union of Railwaymen and the Associated Societies of Locomotive Engineers and Firemen had already drafted new demands and asked principally an advance in wages of 5s. ($1.25) a week. The war stopped negotiations, but other negotiations between the men and a committee of general managers were completed on February 19 and 20, which call for large increases in the form of a war bonus.

A bonus of 3s. (75 cents) a week is paid to all employees 18 years of age and upwards, embraced in the conciliation scheme, whose standard rate of wages is under 30s. ($7.50), and 2s. (50 cents) to employees whose standard rate of wages is 30s. or more; the first payment was made in the week commencing February 15. The arrangement is to remain in force during the continuance of the present agreement between the government and the railways, but is subject to review at the end of three months. When notice is given by the government to terminate its control of the railways the latter are to give not less than two weeks' notice to the railway men to discontinue the bonus.

There will be an extension of the basis on which men in the various services will be admitted to the conciliation scheme, so that increases will also be made to the engine terminal forces and the signal and maintenance of way employees.

It is also expected that the Scottish railways and certain of the English lines not included in the conciliation scheme will make similar increases, and it is not unlikely that something will be done for the shop men, clerks, etc. The Railway Gazette (London) has estimated that if these services be included the total advances in wages will aggregate not less than $16,000,000.

ARBITRATION OF ENGINEERS' AND FIREMEN'S DEMANDS

Rebuttal testimony on behalf of the engineers and firemen was begun before the board of arbitration at the hearing at Chicago on March 2 by W. J. Lauck, statistician for the brotherhoods. Mr. Lauck introduced as exhibits voluminous pamphlets on the past financial management of the railroads, intercorporate relations, interlocking directorates and concentration of financial control, including a large number of extracts from the reports of the Pujo commission. Mr. Lauck also brought in the land grants to western railways by the government. He said that the decline in railroad credit was due largely to the fact that their managers had been talking hard times. Arbitrator Nagel asked the witness if he thought business was in a sound condition. "No," replied the witness. "Then," said Mr. Nagel, "the railroads are justified in saying that business is bad, and to that extent you would have to revise your statement."

One exhibit reported to be a recapitulation of the physical operations of 10 of the most important western roads from 1900 to 1910, consisted mainly of extracts from reports of investigations. Mr. Lauck claimed that the aggregate bonuses to stockholders of these roads in 10 years amounted to $250,000,000, and said that this system of financing imposes an unwarranted burden on the productive efficiency of the roads. A large number of the witnesses' statements were qualified after questions by Mr. Nagel and by W. L. Park and H. E. Byram, the railroad representatives on the board. "My chief contention," said Mr. Lauck, "is that the tendency to increase capitalization against the future earning power of the railroads is a tax upon its productive efficiency and tends to prevent proper participation by labor in the profits." "Don't labor's claims come first?" asked Mr. Byram. "You have to pay your operating expenses first, of course," admitted the witness.

On March 4 Mr. Lauck introduced records of investigations of the St. Louis & San Francisco and the Rock Island. Grand Chief Stone, of the Brotherhood of Locomotive Engineers, explained that these were not selected because of any grudge against them, but because the data were at hand.

"Personally, I wish you had taken some other roads," said Mr. Nagel, "because I have heard these records so often they have lost their novelty." Mr. Lauck spoke of the unwise acquisitions of subsidiary companies by the Frisco, many of which, he said, were unprofitable.

After Mr. Lauck had said the employees did not reap any of the profits of the Frisco financial deals, Mr. Nagel said neither did they share any of the losses.

"I know that a lot of this stuff is an old story to most of us here," said Mr. Stone, "but there are 65,000 men running engines in the West who will be very much interested in reading it. It will prove to them that an honest effort was made to do everything that could be done to win their case. Of course the railroads want to shut out the effect of financial mismanagement."

"As the representative of 98 railroads I here and now request that this board will not shut out anything Mr. Stone thinks is of the slightest interest to the members of his organization nor which he may think has the least value," said James M. Sheean, counsel for the railroads. "We have not made any objection whatever to anything you have offered. We have contended from the first that the wealth or poverty of a railroad does not affect the question as to what constitutes a fair wage for employees."

"We have let so much of this stuff in that I suppose we will have to continue it," said Mr. Nagel, "but an immense amount of testimony has been presented in this case which should have been eliminated."

Mr. Lauck said he did not believe shippers would oppose an increase in freight rates to pay higher wages to engineers and firemen. Mr. Sheean promptly asked him: "How do you reconcile your statement with the fact that in this city right now before the Interstate Commerce Commission organizations of shippers are opposing the application of the railroads for an increase in freight rates aggregating only about $10,000,000, while before this board of arbitration the same railroads are opposing your demands for an increase in wages of $41,000,000 for the engineers and firemen alone; that is four times the amount of the proposed freight rates increase?"

RATIONAL GOVERNMENTAL REGULATION*

By Hon. Oscar W. Underwood
United States Senator from Alabama

The money invested in American railroads exceeds the public debt of the greatest four nations in the world; and the wages paid to employees is nearly as large as the pay of the armies fighting in Europe, and the public in the end must pay every dollar required for the maintenance and operation of the railroads. The prosperity of the country must languish if the railroads fail to perform their functions successfully.

We have undertaken the problem of governmental regulation, and the government will not turn back. Regulation of practices and rates is here to stay. But let us stand for wise and just regulation. Revolutions never move backward. If governmental regulation is unable to solve the vexed problems that confront us the people will accept government ownership as the next step ahead. It is therefore a matter of great importance that we should endeavor to reach a fair and reasonable solution of the problem of regulation at as early a day as possible.

It is of the highest importance that no unnecessary roads be built in future and that only those be extended and developed which are best adapted for their function. Low rates and adequate facilities are demanded by the public, but the granting of one is often the denial of the other. If a corporation earns more than an adequate income, the rates may be regulated, but if the revenue is not a fair return on the invested capital, the government is powerless to act. The matter of dividends is today a very small part of the question; the public must be interested in the items that make up the operating expenses of the railroads if it desires both adequate facilities and reasonable rates.

Public control has reduced rates and abolished unjust discriminations, but the greater problem remains unsolved. Can the money be provided to expand and develop these great public works in a manner commensurate with the expanding needs of our commerce under the present system of government control? We must give all credit to the present system of regulation for the accomplishment of much good in the service of the public; but those who are studying railroad problems must admit that it is breaking down in so far as it has supervised the finances of our railroad system so that credit may be maintained.

If railway investments cannot be made attractive to capital, is not the nation threatened with an inevitable breakdown of its transportation system? There is no more difficult problem ahead of us than the transportation problem, and no more inviting field for the exercise of true statesmanship.

Let us inspire courage and give aid to those leaders who, not by chance, but through merit, direct our industry, control our trade, and manage our finance. It is not enough for our government to permit them to rise from the prostration that has overtaken them and their affairs; it must occasionally assist them. We have reached the point where sound progressivism must recognize that the proper regulation of business requires that it must be sometimes helped and not always hindered, that we must occasionally say "You may," and not always "You shall not." We need only to permit railways, traders, and bankers that economic freedom which is consistent with a wise and helpful regulation of all affairs and to give every citizen the national protection to which he is entitled wherever he may rightfully be, at home or abroad, for our trade to gain its lost position and our flag to be seen on every sea.

*Extracts from an address before the Sphinx Club, New York, March 9.

Factors Influencing Fuel Economy in Locomotives*

Effect of Design, Maintenance, Handling at Engine Houses, the Operating Department, Quality of Fuel, etc.

By M. C. M. Hatch

Superintendent Fuel Service, Delaware, Lackawanna & Western

During the year ending June 30, 1913, there was expended for fuel supply on American railroads the sum of $241,598,314, this amount being 11.4 per cent of the total operating expense. The tonnage equivalent was, approximately, 130,000,000 tons. A generally accepted figure of 20 per cent is allowed for stand-by losses on the road, in the engine house, en route from cars and tenders, waste at pops, etc. Assuming that this is correct, we have then 80 per cent of the total amounting in value to $193,000,000 being put through our locomotives yearly, while doing useful work. The thermal efficiency of the modern locomotive is in the vicinity of 5.5 per cent so that, if fully utilized the cost of fuel for doing the work calling for nearly two hundred millions would be about $11,000,000, the tremendous difference being made up of wastes, both avoidable and unavoidable, which do not, actively, move a ton of freight or a passenger. A heat balance will show about where these losses, so far as the boiler is concerned, occur and from analyses of recent tests on modern power, the following balance has been made:

Loss	Per cent
Combustible present in ash	6.00
C O	1.20
Sparks and cinders	6.30
Heat rejected at stack	13.00
Radiation and unaccounted for	11.00
Total loss	37.50
Utilized by boiler and superheater	62.50

Between the boiler and the application of the power at the rail, there are other losses of great magnitude, which reduce the over-all performance to the comparatively small figure of 5.5 per cent. Of these losses the most important, as well as the most difficult of reduction is the heat rejected from the engine cylinders at the exhaust. With all steam engines, but especially with those of single expansion, non-condensing design, this thermal waste occurs and hardly appears to be susceptible of much reduction.

We may state, under seven general heads, the factors which exercise control over the fuel consumption of locomotives. These are: (A) Design; (B) maintenance; (C) engine house attention; (D) fuel; (E) operating department; (F) engineers, and (G) firemen.

(*A*) *Design.*—In attacking the design of a locomotive there are certain known factors, such as limiting wheel loads, right-of-way clearances, topography of road, class of service, power to be developed at the drawbar, etc., upon which to build, as a foundation. In the first survey of the problem we will be able to determine wheel and cylinder size and boiler pressure. From these the maximum horsepower output to be expected of the engine becomes known. The boiler should supply steam sufficient to hold the engines up to this horsepower delivery, if most satisfactory results are to be obtained. Boilers of 100 per cent capacity, and even considerably more powerful, are now the rule. The use of combustion chambers in large power boilers would seem to be advantageous, increasing firebox heating surface and volume, and shortening what might otherwise be excessive tube length. A ratio of tube length divided by inside diameter of 110 to 1 would, from present information, seem to be as far as we should go and a reduction to 100 to 1 may prove, in service, to be more satisfactory.

The design of the cylinder as regards clearance volume and ratio of stroke to bore will affect the water rate and, hence, the coal pile. Piston speed should not exceed 1,500 ft. per minute at the calculated maximum speed, equivalent to diameter of wheel in inches. The piston valve may be of small diameter, especially with superheated steam. One road is now using a 12-in. valve in all classes of power and this, if trouble is not experienced with the valve rings, would seem to be a step in the right direction. A small valve means a light valve and a light valve means much reduced stress on the valve motion, especially at high speed.

The front-end should develop the needed vacuum at the front tube sheet with the least possible back pressure on the engine pistons. To arrive at this result, the gas friction within the front-end itself must be reduced to a minimum by providing ample netting areas, unrestricted gas passages and by eliminating, so far as possible, abrupt changes in direction of gas flow.

The grates should have as large percentage of air openings as can be obtained without loss of fuel through them. They should be well fitted to their bearers, and these again to the sheets to preclude the loss of fuel at these points. Dump grates when employed should be placed at the back of the box to make impossible an influx of cold air against the flue sheet, when used on the road.

Ample air inlet openings under the fire are a prime necessity. Tests, however, show that if, with the ordinary pan, 14 per cent of the grate area be allowed for air inlet area with bituminous coal and 8 per cent with anthracite, further increases of area, within reasonable limits, will have very little effect on the ash-pan draft. With bituminous burning switching engines it may be best to reduce the 14 per cent allowance somewhat, in order to prevent too much waste of steam through the safety valves, but in general the figures given will be found satisfactory.

The efficient locomotive should have a high-degree superheater, a brick arch, a power operated firedoor to relieve the fireman of unnecessary work and to encourage him in light and frequent firing, some means of handling the valve motion other than the time honored lever, so that the engineer may work his engine to the best advantage without fear of his life and good injectors so that the man is not tempted to carry too much water in the boiler for insurance against injector trouble. Cab decks and aprons should be designed with a view towards eliminating fuel losses from the engine when in service. A cab arrangement, convenient and safe for the crew, will also influence the operation of the locomotive for the better.

(*B*) *Maintenance.*—The well designed locomotive is capable of giving the best operating results only so long as maintenance is followed up. This means proper back-shop and engine-house facilities, the latter being very important. The road which has a first-class main shop, but is deficient in means for taking care of the necessary running repairs at its engine houses will find its unit locomotive repair cost higher as the engines go through for general repairs than will one whose main shop is perhaps not so elaborate but which is better organized at engine division points to keep up the day-to-day repairs. The importance of proper reports from enginemen is great. The bald statement on the work book that the engine is blowing is no great encouragement to the overworked engine house foreman to start on a tour of exploration through cylinders, main valves and by-pass valves. The report should state, fully and definitely, what is wrong and should be made out immediately on reaching the house. One of the most satisfactory ways of handling this matter is to have a clerk to whom the engineer as soon as he has registered in, dictates his list of troubles, which are reread to him, or by him, and signed. Every endeavor should be made

*Abstract of a paper read before the New England Railroad Club, February 9, 1915.

to make the repairs before the engines again go out, the spirit of "Well, I guess she'll hold together for another trip," being an expensive one and productive of engine failures. The tendency, when an engine is turned in as "not steaming," is at once to reduce the nozzle size. This should be the last resort, especially if steam has been made satisfactorily with the original nozzle, as we are at once imposing additional work on the engines when the exhaust area is reduced.

(*C*) *Engine House Attention.*—The treatment of locomotives at terminals, aside from repairs is important. When fires are cleaned the men must be taught to waste as little live fire as possible to the ashpit, the blower must not be used harder than is necessary to keep the smoke and gas out of the men's faces and the pump should be shut off to keep the ashes and dust out of the air end and also to save the flues from cold air, which the pump exhaust will draw through them. If the engine is to stand in the house for a period of 36 hours or more it will generally be cheaper to dump the fire on its arrival. If engines are kept under steam the fires should be bright and alive next the tube sheet but with the back end pushed ahead and the back section of grates bare. With this method the fire doors may be kept shut, not allowing smoke to fill the cab, and the engines will stand for a long time without attention, never gaining steam enough to open the pop, but holding plenty to work the injectors, move the engine at short notice or for any other practical purpose. Another good feature of this method is that, when the fire is being prepared for service, the back half is practically clean, as coked coal from the front of the grate is merely pulled back to cover the grates which have been bare. A saving can often be effected in fire building if a careful analysis of the situation is made. Flue blowing must be followed up and pains taken to see that the work is done properly, and tanks must not be overloaded at coal chutes.

(*D*) *Fuel.*—The New England roads must import their entire supply and the matter of transportation rates influences largely the locality and hence the kind of coal purchased. Other roads, differently situated, may have little or no concern with this phase of the problem; for instance, the Lackawanna gets its entire passenger engine supply from a point on its main line of fairly central location. This fuel, anthracite, would be prohibitive in cost on a New England road.

Bituminous coal, no matter where obtained, should be required to run of uniform quality; it should be low in ash and sulphur, of a medium volatile content and, when run-of-mine, as is generally the case, not over 50 per cent in slack. It may pay, under some conditions, to buy screened coal, but generally run-of-mine will be satisfactory. It would seem that the ideal way to purchase coal would be under specifications, but few, if any, roads follow this practice. A run-of-mine specification could, however, be drawn up on an ash, sulphur and slack basis which would not be oppressive to the operator and yet would safeguard the consumer's interest satisfactorily. We buy about everything from corn brooms to locomotives on specifications, rigid and unchangeable, but our coal, so long as it is black, generally goes unchallenged for we have nothing definite to challenge on. The department making the purchase should consult with the mechanical department to determine the most suitable fuel which it is consistent to procure. One further point in this connection is that of check-weighing the coal as received, comparing actual scale weights with the bill weights, from which they will be found sometimes to differ materially.

(*E*) *Operating Department.*—The train operation of a railroad influences the coal consumption very materially. To merely mention certain points, overloaded trains requiring an excessive length of time between terminals and unreasonable working of the engine; poorly made meeting points necessitating long delays en route; failing to give inferior trains all possible time ahead of delayed superior trains; failing to pay due respect to the topography of the road when laying out regular train schedules; failing to lay out meeting points to bring them at the most advantageous points regarding profile; stopping trains unnecessarily for orders or any other reason; calling engines unreasonably long before they will be needed; calling helper engines when not needed and neglecting to call them when they should be used; locating water plugs without due regard to road conditions; all these and more eat into the coal pile and can generally be classed as unnecessary wastes. The practice of having despatchers put in a trip or two monthly over the road, riding drag freights and other trains which are apt to be unduly long en route would seem to be a very good one, as in no other way can such a clear idea of actual conditions be brought home to these men, whose business is to keep the cars moving. The operating department is a fertile but little cultivated field in which much can be done to increase fuel economy.

(*F*) *Engineers.*—The right side of the cab is no mean factor in this discussion. A careless or ignorant engineer can just about nullify all the efforts of the designer, shop and engine house forces, fuel agent, operating department and fireman. He will work his engine with light throttle and long cut-off when it will do better with the throttle open and the lever back a few notches, and vice-versa. He will start with a spasm of slipping which will turn the well prepared fire bottom side up. He will pump his boiler full and then shut off the injector and run away two gages before putting it on again. He may do many more things which should not be done and leave undone many which should be done, the net result being wasted coal. Our good engineers, of whom we must thank our stars we have so many, are coal and money savers for the company, and must have their just recognition as such.

(*G*) *Firemen.*—There is too much tendency to tell a fireman going out on some engine whose boiler is in poor condition and with an engineer who uses only the lowest notch on the quadrant and who believes he should have a full glass all the time, to fire light and often, and then to proclaim that strenuous efforts are being made to effect fuel economy. I believe that of the enormous total savings which can be made in the fuel bills of the railroads of this country, the firemen can not effect more than 20 per cent of the aggregate at the outside. If we will educate these men, as we must the engineers, and then do our share by paying all possible attention to the points elaborated under the foregoing heads, the firemen will take care of themselves. No man will shovel a scoop more of coal than he has to because of circumstances over which he has no control, assuming that he is properly instructed. This is not to be interpreted as meaning that all firemen are doing their best, for such is not the case. It does mean, however, that in the writer's opinion, this part of our problem would be very easy of solution were the others solved satisfactorily and permanently.

Now to what does the foregoing lead us? It is hoped that by its study we will be able to analyze the individual losses we must combat, indicate the responsibility for each, and so be able to make an intelligent attack upon the whole problem. Such an analysis is given below, the factors responsible for each loss being referred to by letter.

Combustible in Ash

A—Faulty grate-work design.
B—Improper grate maintenance.
C—Improper fire cleaning.
D—Coal which clinkers instead of burning down to ash.
E—Engines called for service and not used.
G—Fires brought in not burned down sufficiently.

Carbon Monoxide

G—This loss is generally up to the fireman, a fire too heavy increasing the *CO* percentage. Usually the total loss in this regard is small, many analyses of smoke-box gases showing but a trace of this gas. Proper firing will entirely take care of this. Insufficient air admitted under the fire will, however, militate against the best performance.

Sparks and Cinders

A—Restricted grate area or anything in the design which will run the fuel rate too high. Brick arch not used.
D—Fuel too friable or too high in slack.
E—Schedules arranged or trains loaded so that engines must be worked unreasonably.
F—Working engine harder than necessary. Slipping.

G—Too heavy fire. Carelessness in placing coal in firebox. Firing fine soft coal, dry.

HEAT REJECTED AT STACK

A—Boilers so designed that heating surfaces are insufficient or inefficient to absorb all heat possible. Insufficient air admitted to the fire.

C—Principally through failure to keep heating surface clean, scale and soot being excellent insulators.

RADIATION AND UNACCOUNTED FOR

A and B—The radiation losses are probably small and can be reduced to a minimum by proper use and maintenance of covering materials.

G—Probably the greatest loss of those unaccounted for is that of unconsumed hydro-carbon gases, such as methane or marsh gas and ethylene or olefiant gas passing out of the stack. This loss is occasioned by improper firing, generally too heavy, liberating greater volumes of gas than can be properly mixed and burned in the firebox. A brick arch will remedy this, acting as a very effective mixer. Smoke is an indication of this condition (although the loss may be present without smoke) as the carbon thus made visible is evolved from the hydro-carbons volatized in the firebox, but not properly burned.

The above items take care, in a general way, of boiler losses and from this we come to the engines. As has been said, the greatest loss here is by heat rejected at the exhaust and this, with a simple engine, cannot be much reduced. Compounding will, however, reduce this loss materially and the writer believes that it will ultimately return to favor.

Stand-by and general losses can be reduced by proper loading of coal on cars at the mines and on tenders, by elimination of water and steam leaks, by keeping the pops closed, by getting trains over the road as expeditiously as possible, etc.

It will be seen that the subject of fuel economy is influenced by and influences every phase of railroading. It is larger than any man or group of men. The labor of every man who, *in any way* has to do with getting trains ready for the road or over the road is reflected in the fuel bill.

DISCUSSION

R. D. Smith, superintendent motive power and rolling stock, Boston & Albany, suggested that some means was needed of letting the engine crews and fire tenders at roundhouses know at the time just what they were doing. The results of weighing coal as it is delivered to the tenders are from 40 to 60 days late, while with some device for counting the scoops of coal put into the firebox the amount of coal used could be very closely arrived at by computation at the end of each trip.

H. C. Oviatt, assistant mechanical superintendent, New York, New Haven & Hartford, said that much good would result if a fuel efficiency committee were organized on each division, according to the plan generally followed in promoting safety.

It was also brought out that considerable improvement might be effected by more systematic and careful attention to the early education of the fireman, in order that he might form correct habits at the outset.

FEDERAL INSPECTION OF LOCOMOTIVES AND TENDERS

The bill, H. R. 17,894, amending the Boiler Inspection act of February 17, 1911, so as to give the Bureau of Locomotive Boiler Inspection the same powers and duties in relation to the entire locomotive and tender that it now has in relation to the locomotive boiler, has been passed by Congress and approved by the President, and goes into effect September 4, 1915. The second section of the act requires that all inspectors and applicants for the position of inspector shall be examined at once touching their qualifications and fitness with respect to the additional duties now imposed. Section 3 provides that this act shall not be held to alter, amend, change, repeal or modify any other law or any order of the Interstate Commerce Commission issued under the safety appliance acts.

In the case of the Boiler Inspection act it was required that rules governing inspection be filed by the railways three months after the passage of the law, and it is understood that the chief inspector will set a similar limit now, that is, on or before June 4 next. The Special Committee on Relations of Railway Operation to Legislation has issued Circular No. 69 to the railways calling attention to the passage of the act, which says in part:

"Inasmuch as the time within which the rules and regulations for the inspection of locomotives and tenders must be filed by the chief inspector of locomotive boilers is very short, it is deemed advisable immediately to call your attention to the alternative courses possible under the act. The important matters are: First, character of the rules and regulations themselves. Second, question as to whether uniform rules and regulations are necessary and advisable.

"When the Boiler Inspection Law was enacted in 1911, its terms were a matter of mutual agreement as between the railways and employees. For this reason, when the formulation of rules and instructions was under discussion, the utmost degree of co-operation was shown by all concerned, and the rules and regulations which were presented to the Interstate Commerce Commission jointly by the chief inspector of locomotive boilers, representatives of the employees and representatives of the railways, possibly went beyond the action necessary under the law, in that these rules and regulations not only covered the matter of inspection, but also dealt with certain standards of construction and workmanship, a deviation from which, it was agreed, caused the boiler to come within the prohibition of the second section of the Act as technically unsafe.

"In view of the extension of the boiler inspection act to all parts of the locomotive and tender, involving an enormous number of parts, and inevitably presenting a great number of controversial questions, it is of immediate importance that the railways consider whether, under the law, it is possible to confine the rules and regulations to the subject of inspection alone; and, if not, the extent to which it will be necessary to go in setting up standards of safety under the varying conditions of the service.

"As to the second question—the filing of the rules and regulations themselves—three courses of action are open: First: For the individual roads to file their rules, which do not become obligatory until they have been approved by the Interstate Commerce Commission after hearing. Second: For the roads to agree among themselves, and file one set of rules, expressing their own views. Third: For the roads to go into conference with the chief inspector of locomotive boilers, and agree, if possible, with the government on a standard set of rules, as was done in the case of the Locomotive Boiler Inspection Law."

UNDERGROUND WIRES ON THE PANAMA RAILROAD

The Panama Railroad, at an expense of about $450,000, has put its telegraph, telephone and signal wires underground throughout the length of the road (47 miles); and W. H. Fenley, superintendent of telephone and signals, has sent us an interesting account of the laying of the vitrified clay duct for the wires, from which we take the following paragraphs:

A committee was appointed in December, 1912, to review the plans for the proposed transmission line across the isthmus, and among other duties, it was to formulate a report on transportation and electrical problems as affected by the presence of the track span bridges, carrying the 44,000-volt, three-phase, 25-cycle transmission circuit, which conveys the power for working the locks of the Panama Canal. The telegraph and telephone circuits were formerly carried on 20 open wires supported on iron poles. Physical interference was offered to the transmission line by the telephone-telegraph circuit. Electrical interference to the telephone-telegraph system was a known factor, as an unbalanced condition on the non-transposed, 44,000-volt line, with its apparent load of 50.5 amperes per wire, would theoretically set up inductive disturbances that would undoubtedly destroy telephone communication. In addition, there was a hazard to employees, due to the static stresses, in the event of a break in the

high-voltage wires, or a cross between the two leads, due to an aerial ground wire breaking.

It was impossible to remove the telephone-telegraph wires a sufficient distance from the high-tension transmission line to prevent inductive disturbance, so cables were considered. The signal circuits had to be tapped so often that it was not feasible to have them in the same cable with the telephone-telegraph line, so it was decided to use two cables. On account of the long span between the track bridges, their use as supports for the cables would have been very expensive. Armored cables buried in the ground are difficult to splice and tap; they are also subject to mechanical damage and to possible chemical soil reaction, so this type of construction was also discarded.

By a process of elimination, therefore, it was decided to use multiple-clay duct, and to draw the cables into it. Fibre duct was not used, because of the possibility of distortion on account of moisture; and the fact that the extreme heat might cause

Wire Duct, Panama Railroad

the impregnating compound to ooze out before the duct was placed in the excavation. In deciding on the size of the duct, the situation was canvassed to see if any outside parties desired to lease a duct across the isthmus, and as one such party was found, the installation was made sufficiently large to provide the necessary capacity. The multiple duct, of which 1,064,000 duct feet were used, was delivered in two shiploads, March 18 and May 28, 1914.

The length of cable sections between load coils was responsible for the spacing of the manholes, as at least seven cuts were required between loading points for the purpose of testing and balancing the cable between any two loading coils. The manholes were spaced 776.83 ft. apart, with intermediate manholes, where tracks were crossed, and to prevent crossing the drainage ditches and on curves. Intermediate manholes were also provided at track relays, indicators and signal locations.

The manholes were designed so that the entire cover can be removed. Where signal wires or secondary telephone-telegraph cable will enter a manhole, a piece of single-duct was let in the side wall when the forms for the concrete were built. An 18-in. by 36-in. hole was left in the bottom and filled with loose stones to drain the water out. The locations are given by stenciling on the pedestal of the nearest track bridge, giving the number of feet and the direction to the manhole, and one of the letters L, R, I, or S, which indicate "loading point," "regular," "intermediate," or "signal" manhole.

It was deemed advisable to construct the duct line continuously and not in sections. The wisdom of this policy was proved by the many changes which had to be made in alinement, due to physical obstructions encountered. Work was started from the Chagres river bridge, one gang working southward and one gang working northward. The curvature on the Panama railroad amounts to 43.44 per cent of the line, which of course made the construction more difficult, especially on account of the rough contour of the adjacent ground, which necessitated that the chords on which the duct line was located should come close to the track. The use of dynamite was prohibited on account of the proximity of the aerial wires, so where rock was encountered the excavation was made very shallow and earth was ridged up over the top of the concrete after completion. Where possible, the concrete was placed below subgrade when it came within 5 ft. of the track.

Each organization was distributed daily over about 15,000 ft. of trench and the work prosecuted in the following sequence: (1) The survey party chained up for the manhole ran in the alinement and set grade stakes, using both transit and level. Test holes were dug when in doubt as to pipes, cables or other underground obstructions. Inverted "T" stakes were then pegged to the ground so as to span the trench at each 50-ft. station, and manholes were indicated by two such stakes, on which all data concerning the individual manhole was marked in blue crayon. Accurate field notes were kept and the alinement and manholes afterward plotted on the standard sectional map of the railroad. (2) The excavation force excavated for both duct beam and manholes according to grade stakes and the indicated alinement. (3) The base concrete force laid in from 4 to 10 in. of concrete, checking the grade after this was in place. These gangs also set all manhole forms and built in forms where the reinforced duct beam had to cross a drainage ditch or a ravine. (4) The duct-laying force inserted the dowel pins, wrapped each end of the duct with a piece of rejected cement sack soaked in a neat cement mixture, and trowelled in enough concrete plaster on either side of the duct to hold it in true alinement when the concrete back fill was later placed around the duct. No duct was laid until the base concrete was practically set. (5) The concrete back fill force placed approximately 3 in. of concrete on the sides and top of the duct. Old boiler plate, sections of corrugated roofing, and lumber were used for side forms where necessary. (6) The back fill force placed an earth back fill on the concrete duct beam, restored drainage ditches, and cleaned up the road bed.

Small forces under a colored foreman removed manhole forms and moved parts of them forward with push cars, although most of the plant was moved from the rear to the front by the work train. Gravel was unloaded from 15-cu. yd. Western dump cars at 200-ft. intervals. A cement shed was then erected at each gravel pile, consisting of a platform 6 ft. by 6 ft., supported by 3-in. by 6-in. joists, and an inverted "V"-shaped roof made of old corrugated siding. Water barrels were also placed at each mixing board and water distributed from a tank car in the work train. Concrete was mixed on about 50 cement boards a day for each organization, carried in wheelbarrows, in either direction, from the board and dumped directly into the trench. A portable blacksmith's shop was carried with each excavation force for sharpening picks and drills. Each organization had its headquarters tent for the timekeepers and cost accountant, and each tent was equipped with a special telephone that not only placed all the tents in communication with each other, but allowed all of them a connection to the nearest telephone exchange.

The cost account sheets show the following tabulated costs for labor and material on 962,360 duct ft. of four-way multiple line:

	Labor.	Material.	Total.
Excavation, per cu yd	$0.75	....	$0.75
Concrete base in place, per cu. yd	2.00	$2.70	4.70
Laying 4-way duct, per lin. ft	.02	.23	.25
Concrete back fill (including placing of forms), per cu. yd.	2.80	3.00	5.80
Earth back fill, per cu. yd	.40	....	.40
Manholes, small, complete	6.33	2.17	8.50
Manholes, large, complete	7.68	3.82	11.50
Average cost per trench foot	.30	.45	.75

When both organizations were producing maximum results, there were about 900 men in the field. Organization No. 1 started April 14, and No. 2, July 6, 1914, and by October 20, 1914, 255,589 trench ft., and 1,100,226 duct ft. were completed, the average being 1,750 trench ft. per nine-hour day. The success of the entire scheme consisted in the manner in which the forces were organized, and the fact that all experimental work and all plans were completed before actual construction was commenced, and was also partly due to the friendly rivalry which was promoted between the northern and southern organizations. The work was supervised by one supervisor and two general foremen, one in charge of each district. Under these men there were 13 foremen and two work-train crews.

The Western Electric Company furnished 258,060 ft. of duplex telephone-telegraph cable and accessories. The award for signal cable was placed with the Kerite Insulated Wire & Cable Company, after an investigation. The contract called for 210,420 ft. of 13-conductor and 46,769 ft. of 9-conductor cable, and two pieces of armored submarine cable, one 460 ft. long and one 2,300 ft. long. Linaduct with slip collars was used for all conduit runs between manholes and signal apparatus.

WATCH YOUR CARS AND STOP CARLOAD TRACING

By F. P. Barr

Superintendent of Transportation, Wheeling & Lake Erie

Traffic and transportation departments of railroads, particularly of the lines serving large tonnage producing centers where competition is strong, have for the past years been flooded with requests from shippers and receivers of freight to trace carload shipments. Many of these requests are made by wire, while others are made through the mails or by telephone.

Some shippers have insisted on all their carload business being traced, and in order to hold the traffic the railroads most invariably comply with such requests. Other shippers or consignees, fearing that their shipments might meet with delay, start tracing in many instances before the cars have had time to get to destination or to the junction point with the next line shown in the routing. It is not an uncommon occurrence for tracers to be started on the same date the bills-of-lading are signed. Cases have been known where shippers started to trace before the loading had been completed.

All of this has resulted in confusion and unnecessary expense to both the shipping public and the railroads, and the tracing proves of little value. It has also resulted in practically every department of the railroad doing more or less tracing, and in many instances two or more departments are found tracing the same cars.

The principle of carload tracing when properly applied is bound to have the desired effect, but this has been badly misused by both the shippers and the railroads. The railroad responsibility for this state of affairs is explained in that they permit cars of expedite freight to be unreasonably delayed in transit, cars being moved at the convenience of the various departments. Loaded cars found to be in need of repairs are not given the proper attention and are often held unreasonably and then, on account of being in need of extensive repairs, are transferred. Traffic representatives in soliciting business have encouraged unnecessary tracing.

A number of roads have been endeavoring to overcome these inexcusable delays and thereby cause their patrons to have more confidence in their ability to move traffic with reasonable promptness and have them cease tracing to a large extent. To to this the roads have realized that they must get away from the old-established custom of doing certain things at certain times each day of the month or year and have adjusted their operations in such manner to meet almost any condition that might arise. They have arranged for the reporting by telephone or telegraph of the movements of cars containing shipments of expedite freight in such a manner that the transportation departments are able to keep a constant watch to prevent any delay which can possibly be avoided.

The Wheeling & Lake Erie recently put into effect a plan of handling expedite freight. This plan cannot be properly termed a tracing system, as in tracing it is a case of following up something that has been done. The plan the Wheeling & Lake Erie has put into use is in a large sense an advance record and results in heading off the tracers. The transportation office in most instances has the cars charged

FORM 1010 L. SM. 7-14

THE WHEELING & LAKE ERIE RAILROAD COMPANY

W. M. DUNCAN, RECEIVER.

REPORT No._____

_____ STATION OR YARD DATE_____ 191__

DAILY REPORT OF CAR LOAD SYMBOL FREIGHT ORIGINATED OR RECEIVED FROM CONNECTING LINES AND REPORT OF FORWARDING BY TRAINS.

DATE BILLED	SYMBOL	CAR INITIAL	CAR NUMBER	CONTENTS	ORIGINATING POINT	SHIPPER	DESTINATION	CONSIGNEE	ROUTING	REC'D FROM CONNECTION	DATE	TIME	FORWARDED BY TRAIN	DATE	TIME
(A)	(B)	(C)	(D)	(F)	(G)	(H)	(I)	(J)	(K)	(M)			(N)		

Agent or Yard Master will use this report in reporting symbol freight billed, the receipt of symbol freight from connecting lines, and the forwarding by trains. Cars containing symbol freight received from connecting lines for switch movement to industries on our line or cars loaded by industries on our line for switch movement to connecting lines need not be reported, except cars on which we receive a pro-rate, which cars should be reported.

Cars containing symbol freight passing through your station or yard or delivered to connecting lines should be reported on Form No._____

This report must be promptly sent to the Superintendent of Transportation by either telegraph or telephone.

Fig. 1—Report of Car Loading

to the point of destination, or the train terminal far in advance of the actual arrival. The reports covering the interchange to connecting lines are made at different intervals throughout the day and in most cases within a few hours after the cars are delivered.

One of the most important features found in this plan is that the Wheeling has records covering all of the movements of carload expedite freight on its line in seven differ-

ent traffic offices located in as many large tonnage producing centers, namely: Cleveland, Pittsburgh, Chicago, Detroit, Toledo, Canton and Wheeling, in addition to the records maintained in the transportation office at Brewster, Ohio. A patron of the line can call upon any of these offices and get the movements of carload expedite freight within 24 hours after cars are moved. These records are maintained from reports made by the transportation office and place the traffic representatives in a position to keep patrons fully advised as to the movement of their shipments either inbound or outbound.

The records show that this plan has already caused a reduction of 75 to 80 per cent in carload tracing. This is the result obtained after the system had been in use but one and one-half months. All carload shipments of expedite freight are covered by this plan and as previously stated, they are constantly under eye of the transportation office, where close check is kept on each movement of a car.

Shipments of coal, coke, iron-ore, limestone and other like commodities are not included, as these commodities are handled in train or part train lots, and their location is reported and movements arranged for by other methods.

A general outline of the plan is as follows: Each station is given a series of numbers commencing with number (1) one, which, together with the telegraph call, compose what is termed the symbol for that station. The first car billed is given the number 1, and if the call is CX the symbol is shown as CX-1, and these symbol numbers are inserted on the waybills in consecutive order as the cars are billed. These symbols are used to save time in telephoning or telegraphing when the agents or yardmasters report the movements through yards or delivery to the connecting lines.

The originating station or the station at which a carload of expedite freight is received, assigns the symbol and reports to the transportation office the following: Date billed, symbol, car initial, number, contents, originating point, shipper, destination, consignee, routing, date and time received from connection and the forwarding by train. When a car is picked up by another train or is placed in another train at a train terminal or end of a division the yardmaster or agent at that point reports only the symbol and the train in which it is forwarded, giving the date and time, and when the car reaches the junction point and is delivered to the connecting line, the delivery is reported by the symbol and the time of delivery is also shown.

If the car is destined to a local point, the arrival at destination is approximated from reports received from the chief train despatcher. Should a car be set out short of destination or short of the end of the train run, the conductor of the train makes a telegraphic report showing where the car was set off and where the billing was left, also stating the reason why he had to take the car out of his train. Upon receipt of this report the transportation office takes the necessary steps to have the repairs made, or does what is needed to get the car moving.

The movement of all cars of expedite freight is reported as the trains are ready to leave the stations or terminals, or immediately after their departure, and should any cars be held at a terminal or station beyond twelve hours, the yardmaster or agent must make a report showing why they are being held and what is being done to move them. Cars held must be reported each day until they have been forwarded. With this report the agent or yardmaster is in position to keep a very close check on his cars and prevent any unnecessary delays. This report also covers cars which are held for delivery to connecting lines.

The blank forms used in making reports in connection with the expedite movement of symbol freight are shown herewith. Fig. 1 is the report made by the agent showing the expedite freight originating at his station or received from connecting lines. After this report is telegraphed or telephoned to the transportation office it is placed on file by the agent. The telegraph operator or the telephone clerk in the transportation office receives this report and notes it down

FORM 1011. 5308. 7-14.

THE WHEELING & LAKE ERIE RAILROAD COMPANY.

W. M. DUNCAN, RECEIVER

RECORD OF MOVEMENTS OF CARS CONTAINING SYMBOL FREIGHT.

STATION OR YARD _____ MONTH OF _____ 191__

	Date Billed (A)	Symbol (B)	Car Initial (C)	Car Number (D)	Contents (F)	Originating Point (G)	Shipper (H)	Destination (I)	Consignee (J)	Routing (K)	Rec'd From Connection (M)	Date	Time	FORWARDING FROM STATIONS (N)	Del'd to Connection	Date	Time

Fig. 2—Record of Car Movement

FORM 1009 L. 10M. 7-14. REPORT NO. _____

THE WHEELING & LAKE ERIE RAILROAD COMPANY

W. M. DUNCAN, RECEIVER

PASSING REPORT OF SYMBOL FREIGHT FORWARDED BY TRAINS AND DELIVERED CONNECTING LINES AND FREIGHT DELAYED

STATION OR YARD _____ DATE _____ TIME SENT _____

SYMBOL (BA)	FORWARDED BY TRAIN (BB)	DELIVERED TO CONNECTION (BC)	DATE (BD)	TIME (BF)	HELD OVER 12 HOURS (BH)	HOURS HELD (BI)	REMARKS (BK)

"IN COLUMN (BH) SHOW REASON FOR DELAY. IF CARS ARE HELD ACCOUNT OF INABILITY OF CONNECTING LINE TO ACCEPT AS OFFERED THEY SHOULD BE REPORTED ONLY ON THE FIRST DATE THEY ARE HELD AND SHOWN AS "RULE 14."

IF CARS ARE HELD ACCOUNT OF AN EMBARGO PLACED BY ANY OTHER RAILROAD THEY SHOULD BE REPORTED DAILY AND SHOWN AS "RULE 15."

Fig. 3—Passing Report

FORM 1007 L. 25M. 9-14.

THE WHEELING & LAKE ERIE RAILROAD COMPANY

W. M. DUNCAN, RECEIVER.

REPORT NO. _____

REPORT OF SYMBOL FREIGHT ORIGINATED OR RECEIVED FROM CONNECTING LINES AND REPORT OF FORWARDING BY TRAINS. DATE _____

DATE BILLED (A)	SYMBOL (B)	CAR INITIAL (C)	CAR NUMBER (D)	CONTENTS (F)	ORIGINATING POINT (G)	SHIPPER (H)	DESTINATION (I)	CONSIGNEE (J)	ROUTING (K)	REC'D FROM CONNECTION (M)	DATE	TIME	LOCATION (N)	DATE	TIME	DEL'D TO CONNECTION	DATE	TIME	REMARKS

Fig. 4—Report of Freight Originated or Received

on Fig. 2. Fig. 2 is a record on which the movement of cars containing the expedite freight is followed. The sheet of which Fig. 2 shows the upper portion is placed in a loose leaf binder. Subsequent movements of the cars containing the expedite freight are entered on this report until the shipment reaches its destination or is delivered to a connecting carrier.

Fig. 3 shows the form of report made by yardmasters and also by agents in case the cars are not forwarded prior to the time that the report, as shown in Fig. 1, is sent. Fig. 4 is the form in which the information received and recorded on Fig. 2 is transcribed, and typewritten copies of this report are sent to the various traffic officers. Included in this report are also shipments for which the billing has been received but the car has not yet been delivered by the connecting line. In writing up this report an effort is made to give all the information on it in regard to shipments at the time the report is written. After the report shown in Fig. 4 is sent to the traffic officers, reports of all subsequent movements are sent to these officers on forms, a sample of which is shown in Fig. 5.

FORM No. 1008 L. 5000. 7-14. REPORT NO._____

THE WHEELING & LAKE ERIE RAILROAD COMPANY

W. M. DUNCAN, RECEIVER

REPORT OF SYMBOL FREIGHT. DATE_____

SYMBOL	ARRIVED HERE	DATE	TIME		DELIVERED TO CONNECTION	DATE	TIME	DELAYED FREIGHT	CAUSE	REMARKS

Fig. 5—Traffic Department Report of Freight

Way-bills of a special color have been furnished to agents to be used in billing expedite freight. A space has been provided wherein the symbol is shown. Rubber stamps have been supplied to the agents and are used by them in applying symbols to cars traveling under interline way-bills.

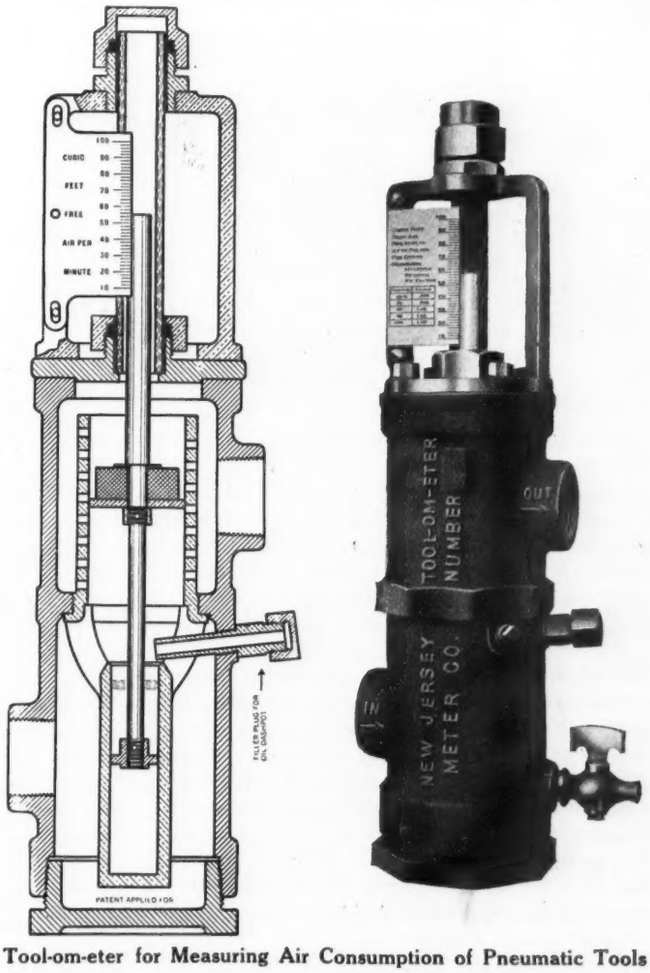
All reports made by the agents and yardmasters are sent by either telephone or telegraph to the transportation office, where they are assembled and the car movements recorded. These records are transcribed upon blanks which are mailed to the various traffic offices. A day and night force is maintained on this work. The work done by the night force is mailed early in the morning and the reports made by the day force are mailed at six o'clock p. m., which means that all seven traffic offices receive their report early the following day.

During the period that this plan has been in use the Wheeling has had on its line daily from 1,000 to 1,500 cars of expedite freight, and the work involved has been handled by five clerks, three working during the daytime and two at night. While this has caused an increase in the payroll of the transportation office, it has resulted in centralizing the handling and tracing of expedite freight, and when the work which was previously done by the various departments, including agents and yardmasters, is taken into consideration, it can be readily seen that the additional expense in the transportation office is more than offset by the saving made in the other offices. Further, it was not necessary to add any help to the agent's or yardmaster's office. In addition to this saving there is a saving in per diem due to better car movement, a big item that should not be overlooked. Furthermore, a shipper is going to give preference to the line which gives him the best service.

A careful check of the records disclosed the fact that the expedite freight is receiving, as a whole, better movement, and further that the movement of dead freight is showing a corresponding improvement for the reason that the yardmasters and agents, in their efforts to keep expedite freight moving promptly, fill out trains with the lower class of freight, and the result is that the traffic as a whole is receiving better movement.

COMPRESSED AIR METER

The illustrations show a device for measuring the quantity of compressed air used for small tools for the purpose of determining their efficiency in air consumption. It is called the Tool-om-eter. It operates on the principle that the volume of a definite compressed fluid or gas flowing under a small constant head through multiple orifice of the same shape and size, is directly proportional to the number of orifices exposed to the flow. By referring to the sectional drawing it will be seen that the air is admitted through the lower lefthand opening, passes upward to the main piston which operates in a cylinder perforated with accurately-drilled holes. As the demand for the air increases the difference in pressure between the outlet and inlet will cause the piston to be raised, thereby uncovering the holes in the cylinder to such a height that the total area of the uncovered perforations will permit an unrestricted flow of the air through the meter. A rod attached to the upper part of this piston indicates on the scale the amount of free air passing through the meter in cubic feet per minute. The difference of pressure caused by the weight of the piston between the inlet and the outlet of the meter is only a few ounces per square inch.



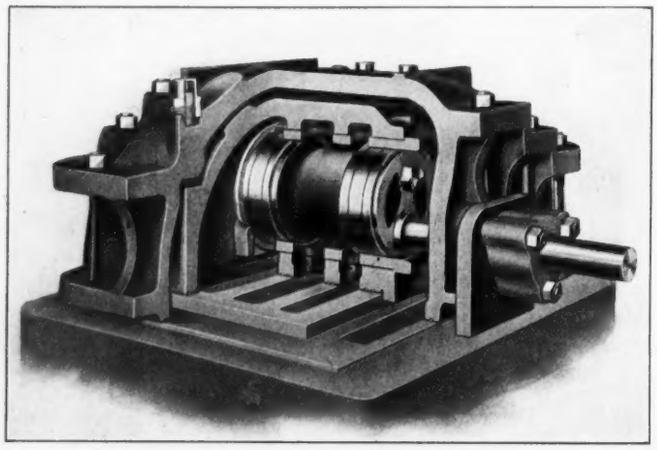
Tool-om-eter for Measuring Air Consumption of Pneumatic Tools

The cylinder at the bottom is filled with oil and serves as a dash pot to provide a more stable operation of the recording piston. It should be noted that this is not a velocity meter but a direct volume gage, and readings may be obtained to within one cubic foot per minute. The meter is of simple construction and contains no leather pockets, rubber or leather discs, bearings, gears, valves, or other parts, which can develop defects to change the accuracy. The use of bronze parts prevents corrosion or rusting. The meter shown herewith has a capacity of from 10 to 100 cu. ft., and is used for various small tools. Larger sizes of meters are also made. This meter is sold and manufactured by the New Jersey Meter Company, Plainfield, N. J.

APPLICATION OF PISTON VALVES TO SLIDE VALVE CYLINDERS

In modernizing existing locomotives, the application of superheaters to engines having slide valve cylinders has heretofore presented serious difficulties in view of the accepted fact that only piston valves can be used successfully with superheated steam. The cost of new piston valve cylinders with their accessories, together with the new front frame sections necessary to obtain a good design of cylinders; the changes necessary in the valve gear, etc., frequently entail so considerable an expenditure as to cause abandonment of the project.

The device here illustrated offers a solution of the problem by enabling a piston valve to be applied to the existing slide valve cylinders without any modification of the cylinders, valve gear



Universal Piston Valve Applied to Slide Valve Seat

or other details. It consists of an inner valve chamber to which a continuous bushing is applied in the ordinary manner. Enclosing this is a steam chest secured to the cylinder by the usual studs without alteration in their original arrangement. The valve chamber is secured to the valve seat by four studs, and six holding-down screws tapped through bosses on the top of the steam chest, in addition to the steam pressure, which is exerted over practically 70 per cent of the area of the seat.

Joint wires of the usual form are used between the steam chest and its seat and wires of the same size are employed between the valve chamber and valve seat. These latter wires are arranged in an ingenious manner to avoid the use of double wires on the bridges, where it is difficult to apply sufficient direct pressure to bed them into the irregularities of the faces. In this arrangement a joint wire surrounds each of the steam ports, and an outer wire surrounds the whole. Thus the double wires come only at the ends and sides of the valve seat where direct pressure can be applied.

A very short and light piston valve is used, with the center of its stem offset downward to conform to the location of the valve yoke stem of the original slide valve. The body of the valve is of oval section, thereby facilitating the passage of the exhaust steam downward to the exhaust port. The form of steam port in the valve chamber is such as to provide ample area for the ingress and egress of steam to the ports in the bushing, and eliminate all baffles which cause eddy currents.

The valve diameter is determined by the length of the ports in the valve seat, being such that its effective length (deducting bridges) is somewhat greater than the port length of the flat valve seat, which has been proved by actual test to be sufficient. This method gives valve sizes and weights as follows:

Port length	Valve diameter	Weight of valve
Up to and including 19 in.....	8 in.	58 lb.
20 in. to 22 in. inclusive.....	9 in.	65 lb.
23 in. and over.....	10 in.	73 lb.

By the use of these small, light piston valves, the wear and tear on the valve gear is reduced to a minimum. As the section of packing ring is the same as for the large valves commonly used, the result is a greatly diminished tendency to buckle and score the bushing while crossing over the ports when superheated steam is used, trouble from this source being practically eliminated. Diagonal bridges are employed in the valve bushing to obviate grooving of the rings.

A notable feature of this arrangement is that outside steam pipes may be used, thereby eliminating all live steam passages from the cylinder saddle, as has become the accepted practice with superheat. In this case a tight cover plate is bolted over the steam pipe boss in the smoke box, and the steam passages in the saddle filled with a rich concrete mixture. A short bent section of steam pipe is used immediately above the chest to facilitate its removal without disturbing the pipes in the smokebox.

This device was developed by the Economy Devices Corporation, 30 Church street, New York. A description of a series of tests of a Kansas City Southern Consolidation locomotive equipped with these valves was published in the *Railway Age Gazette*, February 26, 1915, page 371.

LACKAWANNA FIRST-AID CONTEST

The Delaware, Lackawanna & Western on February 25 held a first-aid contest at its Hoboken, N. J., terminal for the men on the Morris & Essex division.

The Lackawanna has been giving its men an opportunity to become proficient in first-aid work for seven years. The men in the neighborhood of the coal mines in particular have had especially good opportunities, because they have had access to the government's first-aid car stationed there. Those on the Morris &

Teams in Lackawanna First-Aid Contest Trying Methods of Artificial Respiration.

Essex division who have desired first-aid training have received their instruction from a course of six lectures given each year by Dr. W. J. Arlitz, who is in charge. Each spring a big contest is held at Scranton, open to all employees of the road, and all who qualify are given diplomas and medals.

The contest at Hoboken was the first at which the men competed for valuable prizes, these prizes having been donated by disinterested persons in Hoboken and Jersey City.

The contest covered such things as: applying a splint and dressing for a fracture of the forearm; artificial respiration; the application of splints for a fracture of the leg; and treating fractures of both thigh bones. The events were 12 in number.

Six teams, averaging six men each, and four individuals competed. Team No. 1 from the electrical department at Hoboken won the first team prize, the Patrick R. Griffin cup, and James Hughan, the captain, was the winner of the first "experienced individual" prize, a diamond locket presented by the Hudson Observer of Hoboken.

The illustration shows several of the teams trying the Schaefer and Sylvester methods of artificial respiration. Those in the foreground are members of the winning team.

Maintenance of Way Section

Accurate Map Records

On some roads station and right of way maps and profiles are kept up to date with great care and all changes in the property locations or in grades are noted on them as soon as made. On other roads because of lack of forces or indifference they have been allowed to lie unchanged until they are now out of date and will require a considerable expenditure for their revision, which appropriation is difficult to secure without showing a definite need. One of the indirect benefits now resulting from the federal valuation is the opportunity given to bring these maps up to date. After being revised, the cost of keeping them up is so small relatively, and they are of such definite value in an engineering office for reference purposes and in saving trips out on the line to secure information relative to minor improvements, that there should be no reason for allowing them to become obsolete again.

Records of Treated Ties

The treatment of timber with preservatives to protect it from decay is a development of the last 30 years. In the last decade the number of plants has trebled and the output quadrupled. Railways have been the pioneers in this work and are today the largest users of treated timber. At the same time, only about 25 per cent of the 140,000,000 ties normally required are treated and there still remains much to be done along this line. While the decision to use treated ties has been prompted in some instances by a desire to conserve the resources of our forests, the primary reason in general has been that of ultimate economy. Because this industry is still practically in its infancy, few authentic actual records of the life of treated as compared with untreated timber are available covering any large number of ties and the bases upon which authorizations for expenditures for the treatment of timber have been made have been largely estimates. Likewise, few roads have installed treated ties in sufficiently large quantities, and for a long enough term of years to show any actual decrease in the normal tie requirements. This at once shows the importance of the compilation of records of the life of treated and untreated ties under a wide variety of typical conditions. While such statistics are difficult to collect, and if not properly compiled are worse than useless, because of their misleading character, they are the only basis upon which the actual economies resulting from timber preservation can be definitely shown, although commonly recognized. The Santa Fe has been a pioneer in the treatment of timber, opening its first plant in 1885, and now operating two plants with a capacity practically equal to its normal requirements. Approximately 65 per cent of the ties now in its tracks are treated, probably a larger per centage than on any other road. It has also had a larger number of treated ties in track for a longer period than any other road in this country. The results which it is now securing are therefore highly instructive. Its normal requirements, for slightly over 11,000 miles of line are about 3,500,000 ties. During the five years ending with 1909 the average number of ties inserted per mile of track was 346, while during the last five years this average decreased to 316, or 9 per cent. For the past two years the normal requirements have shown a decrease of about 600,000 ties annually. As the standards of maintenance have been maintained, if not raised, during this latter period, this reduction in the tie requirements may be fairly attributed to the results of timber preservation. This is probably the first record of this nature on so large a scale in this country. Within a few years similar records will undoubtedly be secured on several other roads which have been treating ties actively for a number of years.

Rail Records

Few records are more difficult to compile and maintain accurately, or are in general more inaccurate, than those showing the amount of rail on hand and its location. There are so many opportunities for discrepancies to arise, nearly all of which are cumulative, that if the material is not checked thoroughly at regular intervals the records soon become of little value. The one redeeming feature of this condition is that while it may not be possible to locate this material in the records, most of it is not lost to the road so that the losses are largely only in accounting. However, if such records are worth keeping at all, and no one questions their value, they should be kept with sufficient accuracy to make them reliable for the purposes for which they are intended. The problem is to secure some method by which this desired degree of accuracy may be attained. Even the closest supervision frequently fails to secure accurate reports from the foremen, many of whom have a limited education. Most of these men naturally feel that their first important work is on the track and they see little or no necessity for the compilation of the records required of them other than the payrolls. It must be admitted that the tendency in this respect has been increased somewhat by the introduction of unnecessary reports in certain instances and by the continuance of other reports after the demand for their compilation has passed, tending to create indifference towards all reports. The plan of making a periodic check of all rail on hand recently adopted on the Albuquerque division of the Santa Fe and described in another column, is one method of securing the proper degree of accuracy. While at the first glance this thorough check of the material on hand would appear to take considerable time when extended over a system, if properly planned it need not require a great deal of time, for much of the information can be gathered in advance as opportunity offers. Furthermore, the fact that foremen realize that they will be required to account for all material turned over to them and to check the amount on hand at periodic intervals will impress them with its value and make them more careful in reporting it.

THE VALUE OF NEATNESS

THE savings resulting from a campaign for neatness about station grounds, tool houses and the right of way in general are commonly considered more or less imaginary, or at least intangible in character. While more attention is being given to this subject now than formerly, many believe that the only returns of any consequence are those resulting from a more favorable impression on the public. A few years ago if a foreman maintained good riding track, little attention was paid to the appearance of the right of way or many of the other details under his care. Today, while requiring the same or even higher standards of track maintenance, more stringent regulations are enforced regarding these other duties. Many of the older foremen and supervisors are not in sympathy with these later ideas and do not believe that they pay. For this reason it may be well to consider some of the reasons prompting this change in ideas and observe to what extent the results are real.

Undoubtedly the intangible result of creating a better impression in the minds of the public regarding the property is one

of considerable value. It is natural for a patron to expect good service from a road which gives the appearance of being prosperous and able and willing to keep its property in good condition. Well maintained property and good service are naturally associated together. There is another tangible result reflected in the morale of the employees. Neatly kept surroundings are certain to create in the employee habits of care and precision. The efficient foreman is seldom the one who is careless with the use of his material, for the same habits which create carelessness also tend toward inefficiency. In general, the section which is neatly maintained will also be found to be most efficiently handled.

There are, however, direct results which may be measured. The value of neatly kept and well policed grounds as an adjunct to the promotion of the safety of employees has been referred to so frequently that we will not discuss it here. Continued carelessness in the maintenance of property necessarily results in excessive and wasteful use of material. The habit of allowing new and scrap materials to accumulate ties up large sums of money unnecessarily when an entire system is considered. The comparisons of the two tool houses described on another page in this issue may be duplicated many times over throughout the country with similar savings in material. Undoubtedly the greatest advantage from a systematic effort to maintain orderly property is this detection of surplus material. This in turn results in a considerable decrease in stock as well as in the losses resulting from obsolete materials.

It is largely for this reason that great attention has been given to this subject during the past few years and the amount of material returned to service or for sale has been surprisingly large. Some of those supervisors and foremen who have been most active in their criticism of these methods will be surprised, if they make investigation, to know the amount of material which is held on their territories unnecessarily.

RENEWING BRIDGES UNDER TRAFFIC

IT is an axiom in every bridge maintenance organization that work must be so handled as to eliminate or at least to minimize interference to traffic. In the renewal of old bridges this may entail considerable difficulty, particularly on lines of dense traffic and without convenient detour routes. It is frequently important that the alinement existing over the old structure be maintained either on account of the economy possible through the use of the old substructure or because of limitations imposed by a lack of right of way or the proximity of important buildings or other improvements. In the case of double tracking a single track structure or in renewing a double track deck girder bridge it may be possible to replace one track at a time, shifting the traffic from track to track between operations, but for single-track bridges and truss spans some arrangement must ordinarily be worked out for making the actual change between trains or for diverting the traffic. Under the pressure of such requirements numerous plans have been devised for handling these problems, many of which are ingenious in their nature and effect considerable economy.

The possible method depends largely on the types of the new and the old structures. When girders replace girders it is preferable to handle each span as a unit either with a derrick car or by lateral movement. The latter method has been developed by some roads to a point where the time of making the actual movement is measured in minutes or even in seconds. When girders replace truss spans it is customary to remove only the floor system of the old structure before placing the new spans in operation.

The more usual problem at present, however, is to renew an old truss bridge with deck plate girder spans, the relative economy of short spans having increased considerably since structures now requiring replacement were built, as a result of the continued decrease in the cost of concrete for substructures. When the old piers are in good condition, as is frequently the case, it is common to replace each truss span with two girder spans, building new piers intermediate between the old ones. The work of renewal must then be divided into units equal to the new span length or half the old span. When derrick cars with a sufficient capacity are available the new girders can be brought up and placed consecutively from one end, the truss floor in each half span being removed immediately before placing the girders. This method as used on the Wheeling & Lake Erie, was described in the issue of February 19.

The span fully assembled may also be carried out to place on flat cars and supported there by a derrick car at one end and a gallows frame at the other, or by suspending from the old trusses by tackle until the old floor is removed. In other cases the assembled spans may be carried out to place suspended between derrick cars or from flat cars and held over the final location while the floor is removed. An economy in the dismantling of the old truss spans after the erection of the new girders was effected by the Pere Marquette by moving each old span out on the shore supported as a unit on flat cars, allowing the dismantling to be handled more quickly and easily. This work is described elsewhere in this issue.

When trusses replace trusses, the erection of the new bridge outside of the old may allow the work to be handled without interruption to traffic and without recourse to falsework in the stream. A striking example of this method is furnished by the Kenova bridge of the Norfolk & Western, which was replaced about two years ago by travelers operating on the upper chords of the old spans, receiving material from construction tracks laid on temporary brackets outside of the new trusses. When falsework can be used for the erection of the new structure alongside the old, the new bridge is frequently placed by lateral movement with slight interference to traffic. This possibility is well illustrated by the article in this issue describing the record performance of the Pennsylvania in moving three 240-ft. spans weighing 2,740 tons in an elapsed time of 10 minutes and 17 seconds.

The handling of movable bridges presents a special problem as the conditions which require such a bridge make impossible the methods adopted for fixed spans. The general practice at present for moving swing spans is to float them on scows. Several instances of the successful handling of heavy bridges in this manner have been described in these columns. With proper preparatory measures the river and rail traffic need not be interfered with unduly. The lift bridges which can be erected in the open position have special advantages in this regard, as it is often possible to complete the erection of such a bridge and put it in condition for operation before it has ever been lowered into its permanent position. The most recent example of a large structure handled in this manner is the vertical lift span of the Pennsylvania and the Chicago & Alton over the south branch of the Chicago river, which replaced a swing span and could not be lowered until the old bridge was cut in two and one-half floated away on scows.

NEW BOOKS

Structural Steel Drafting and Elementary Design. By Charles D. Conklin, Jr., in charge of structural design, Cooper Union Schools, New York City. Size 9 in. by 12 in., 154 pages, 149 illustrations. Bound in cloth. Published by John Wiley & Sons, New York City. Price $2.50.

As a large number of the graduates of engineering schools begin their practical experience as structural draftsmen, a book giving complete instructions as to methods of detailing and designing the ordinary structures should have a wide application. "Structural Steel Drafting and Elementary Design" is intended for use both in class room work in engineering schools and for reference by draftsmen. It covers in considerable detail the organization of a structural steel designing office, requisites for working drawings and the methods used in designing and detailing ordinary structures. The designs and details for a steel roof, a deck plate girder railway bridge, a country highway bridge, and a through-riveted railway span are included. The general specifications for steel railway bridges of the American Railway Engineering Association are published in an appendix. The illustrations include many full page plates illustrating the arrangement of working drawings and the method of showing details.

Letters to the Editor

A SPECIFICATION FOR ZINC CHLORIDE TREATMENT

CLEVELAND, Ohio.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

There is apparently a wide divergence of opinion and much misunderstanding among users of chloride of zinc for the treatment of timber owing to the fact that some important features are left out in the consideration of this question. These are the individual variation in the absorption of the solution by various kinds of ties and different species of wood, and the temperature of the solution at which the percentage of strength is taken.

It has been the almost universal custom in this country to specify a certain quantity of dry salt per tie, or per cubic foot of timber, on the supposition that individual ties in the same charge absorb an equal quantity of solution. This is incorrect. It has been clearly demonstrated that the absorption of individual ties in the same charge varies greatly, depending upon many factors, such as the species and character of wood, the degree of dryness, the size of tie, etc. It has also been clearly demonstrated that the variation in absorption, when treated to refusal, ranges from 10 to 50 lb. per tie for oak, from 20 to 65 lb. for beech and from 30 to 90 lb. for loblolly or soft pine, when ties are seasoned in the open air and treated in the usual manner. Therefore the *average* absorption for oak would be 30 lb. per tie, for beech 42 lb. per tie and for pine 60 lb. If we treat these three kinds of ties with a solution 3 per cent strong—that is, 3 lb. of dry salt dissolved in 97 lb. of water—some will absorb as little as 0.3 lb. of salt, while others will absorb as much as 2.7 lb. per tie. Perhaps the *average* would figure 1.5 lb. per tie, but that is manifestly not the proper way of specifying the quantity and the strength of the chloride of zinc that should be injected into the timber.

Also the temperature of the solution must be taken into consideration when the readings are taken with a Beaumé hydrometer. In the heavier solutions, say, 30 to 60 per cent strong, the influence of temperature is small, so that no account need be made of it, but with those highly diluted it is necessary to define the effect of temperature very carefully to get a true measurement of strength. No more satisfactory means has been found for testing the strength of a chloride solution than Beaumé's hydrometer, using the coarse hydrometer, 1 to 60 deg., for the concentrated solutions, and the fine hydrometer, 1 to 6 deg., divided to 0.1 deg., for highly diluted solutions.

The degree of dilution recommended by William Burnett is 1 part by volume of the salt to 50 parts of water; that is to say, the strength should be 2 per cent. The late Samuel Rowe professed to have demonstrated that ¼ to ⅓ lb. of chloride of zinc salt per cu. ft. of timber, in the shape of 6 in. by 8 in. by 8 ft. pine ties, was sufficient to protect it from decay. European railways do not specify the quantity of salt per tie or per cu. ft. of timber treated, but they specify the degree of strength, according to Beaumé's hydrometer.

The percentage of strength of solution used by European railways is between 2½ and 3 per cent. The solution is injected to refusal and no variation is made in the strength of the solution for different species of wood; the same strength being employed for all woods, whether they be oak, beech or pine. That seems to be rational, as no one has as yet demonstrated, or even asserted, that the solution should be made stronger for one species of wood than for another.

The strength of the solution should be sufficient to prevent decay, and possibly a little more to make up for any salt that might leach out of the ties in the course of time. It should also be borne in mind that this can be overdone and there is danger of making the solution too strong and injuring the fibre of the wood. In 1863 the Philadelphia, Washington & Baltimore built a Burnettizing plant and treated several thousand beech ties with chloride of zinc. It was reported that the ties were as "brittle as a carrot," which was undoubtedly caused by using too strong a solution. The strength of the solution is not stated, but it is said to have been about 6 per cent, which on the basis of an average absorption of 42 lb. per tie would be equivalent to 2.52 lb. of dry salt per tie.

Many of the specifications in this country, covering the treatment of ties with chloride of zinc, call for an injection of a mean between these two extremes, namely, an *average* of 1½ lb. of dry salt per tie. In treating oak ties having an *average* absorption of 30 lb., the strength would be equivalent to 5 per cent; for beech with an *average* absorption of 42 lb., 3.5 per cent, and for pine with an *average* of 60 lb. per tie, 2.5 per cent strong. It has never been found possible, by any known process, to inject into each and every tie an equal quantity of preservative, therefore, the strength of the solution should be fixed and not the quantity of dry salt per tie, or per cu. ft. of timber. Some ties may absorb but little, and others a great deal, but the strength of the solution should be the same for all. The strength should be expressed in degrees Beaumé, at a certain temperature. Then, and not until then, shall we have a definite understanding as to the strength and quantity of chloride that should be used for treating ties and timbers.

I would suggest the following specification for the treatment of railroad ties of all kinds, with chloride of zinc, either singly or in combination with creosote oil:

"The zinc solution must have a strength of 3.5 deg. Beaumé, at a temperature of 70 deg. F. This is equivalent to 3 per cent strong. Ties of all kinds and sizes should be treated to refusal."

W. F. GOLTRA,
President, W. F. Goltra Tie Company.

ABSTRACT OF ENGINEERING ARTICLES

The following articles of special interest to engineers and maintenance of way men, to which readers of this section may wish to refer, have appeared in the *Railway Age Gazette* since February 19, 1915:

The Mercury Freight House Tractor Truck.—A new tractor truck that has been performing satisfactory service in the freight houses of the Chicago Junction Railroad and the Chicago & Eastern Illinois at Chicago, was described in the issue of February 26, page 361.

A New Car Ferry with Adjustable Deck.—The ferry which is soon to be placed in operation carrying trains of the National Transcontinental Railway across the St. Lawrence river near Quebec, designed with a provision for adjusting the track deck a vertical distance of 18 ft. and special equipment for heavy ice-breaking service, was described in the issue of February 26, page 365.

Michigan Central Steam-Electric Wrecking Crane.—A new crane designed to operate either by steam or electricity, which was built recently for the use of the Michigan Central in and adjacent to the Detroit river tunnel by the Industrial Works, Bay City, Mich., was described in the issue of February 26, page 369.

Appraisal of the Pere Marquette Lines in Michigan.—An abstract of a report to the Michigan Railroad Commission by Professor M. E. Cooley on his valuation of the lines of the Pere Marquette as compared with previous valuations of that property, was published in the issue of February 26, page 376.

Viaduct Construction on the Kansas City Terminal.—A discussion of the conditions governing the design of the 21 viaducts and 12 subways which were built as a part of the grade reduction and grade elimination work in connection with the Kansas City terminal improvements, written by A. R. Eitzen, office engineer, Kansas City Terminal Railway, was published in the issue of March 5, page 397.

Retaining Walls on Soft Foundations.—An abstract of a paper by W. S. Lacher presented before a recent meeting of the Western Society of Engineers, outlining tests made by the Chicago, Milwaukee & St. Paul on block and other types of retaining walls at Milwaukee, Wis., and describing the successful use of block walls at that place was published in the issue of March 5, page 411.

An editorial commenting on the problem of designing an economical retaining wall was published in the same issue, page 393.

Replacing a Large Truss Bridge by Lateral Movement*

Reconstruction of Three Double-Track Through Spans 240 ft. Long on Falsework 44 ft. 9 in. from Center Line

By J. C. Bland
Engineer of Bridges, and
John Miller
Assistant Engineer, Pennsylvania Lines West, Pittsburgh, Pa.

Of the 56 bridges on the Pennsylvania Lines West that were totally or partially destroyed in the flood of March, 1913, the structure crossing the Muskingum river about 4½ miles west of Coshocton, Ohio, was the most important and embodied in its reconstruction the most features of interest.

The old structure, built in 1900, consisted of four double-track through pin connected spans, each 152 ft. 2 in. long, and slightly skewed, supported on three piers and two abutments, the foundations of which were carried down only a short distance below the then bed of the stream.

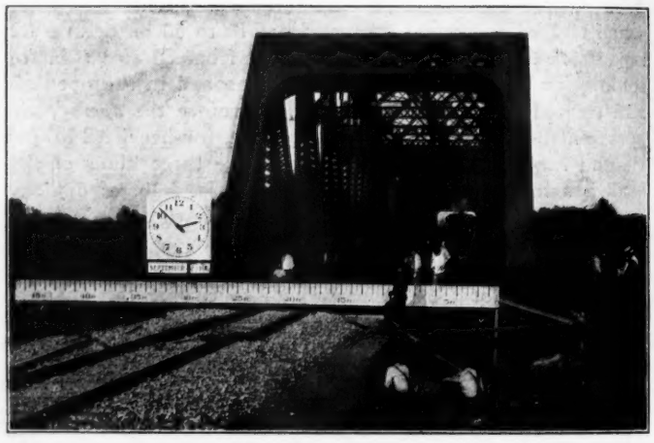
In the flood, pier 3 was washed away, carrying with it spans Nos. 3 and 4, the latter being swept about 200 ft. downstream. Pier No. 2 settled 6 ft. on the upstream end, letting down the west end of span No. 2. Pier No. 1 and the abutments were undamaged. It was found possible to level up span No. 2 on cribbing, and to use this span as well as span No. 1, which was undamaged. A single-track pile trestle was driven across the opening and the second track was afterwards carried across on four 89-ft. deck plate girder spans, which were on hand for the renewal of another bridge. These girder spans were supported on cluster pile bents, leaving openings of about 60 ft. The pile trestle track was subsequently changed to similar deck girder spans to avoid blocking the waterway with piling. Double-track traffic was carried over these temporary spans till July 20, 1914.

New Bridge Completed on Falsework 44 ft. 9 in. from Permanent Location

It being decided that more waterway was required, the new bridge was designed for three double-track through riveted truss spans, each 240 ft. long, on new concrete masonry. Since, in all probability, the old piers failed from undermining, it was desirable to carry the new masonry below the influence of any future scour, and as borings, made at the new pier and abutment locations, and carried to a depth of 140 ft., failed to disclose anything but sand and gravel, it was decided to carry the pier foundations by pneumatic caissons to about 75 ft. below the base of the rail or 45 ft. below low water, this being about 38 ft. below the lowest point of the river bed.

It was originally intended to build the abutments in the open on concrete piling, but afterward, both to hasten the work and to be independent of weather conditions, the pneumatic process was adopted for the abutments also, and these were carried down to 31 ft. below low water. The grade line over the bridge was raised three feet.

The pier caissons were actually sunk to 73 ft. below base of rail or about 36 ft. below the lowest point of river bed, at which depth a good gravel about 4 in. in diameter was found. The average rate of sinking for the entire job was about 2 ft. per day, which was considerably more than was anticipated. The maximum air pressure used was 22 lb. per sq. in.



Moving in the New Bridge Showing Clock and Telltale for Indicating the Position of the Span and in the Distance One of the Two Derrick Cars Which Furnished the Power

A mixing plant and material bins were installed at each end of the bridge, the concrete for Pier No. 1 being trucked from the east end mixer on a trestle and that for Pier No. 2 from the west end on a track carried on outriggers secured to the girders of the temporary spans. The mixture used was 1:2:4 throughout, and no reinforcement was used. The total amount of concrete used was about 7,000 cu. yd.

The piers are rectangular, with a segmental cutwater on the upstream end. They are 46 ft. long and 8 ft. wide under the coping, and have a batter of 1 in 12.

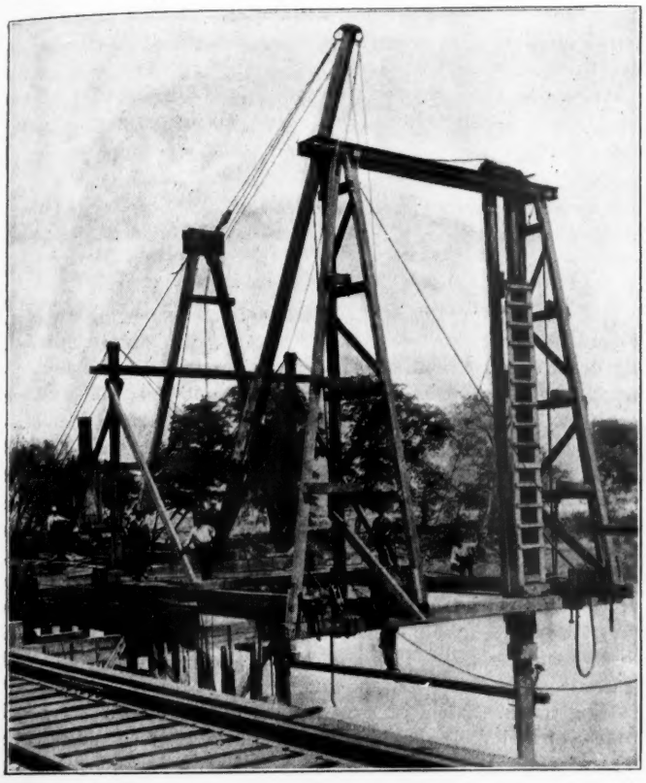
While the masonry was being built the wrecked spans were removed from the river, the parts above water being burned apart with an oxy-acetylene flame, and hauled out by a 75-ton guy derrick. The submerged parts were dynamited and removed, a diver being employed in the under-water operations.

The new trusses are spaced 31 ft. apart and are 44 ft. high at the center and 35 ft. at the hips. The structure was designed for a live load of 5,500 lb. per lineal foot of track, and 66,000 lb. concentrated weight, with an addition of 50 per cent concentrated weight in proportioning the end connections, and in determining

*Abstract of a paper presented before Section D of the American Association for the Advancement of Science at the Philadelphia meeting, December 30-31, 1914.

the sections used in posts, diagonals, end posts and the two end panels of the bottom chord. The total shipped weight of the three spans was 2,740 tons.

Owing to the heavy traffic it was not desirable to erect the bridge on its permanent alinement and the following scheme was adopted. Temporary extensions of the piers and abutments were built on the downstream side of such a nature as to be capable of carrying double-track traffic, and on these extensions the new bridge was erected on falsework at a distance of 44 ft. 9 in. from its permanent location. When the new spans were completed traffic was diverted over them as a run-around, the old spans were dismantled and the temporary spans removed. The new spans were then rolled into their permanent position.



Special Pile Driver Placing Falsework Bents 30 Feet Ahead of Last Bent Driven and Designed to Drive Six Piles at One Setting

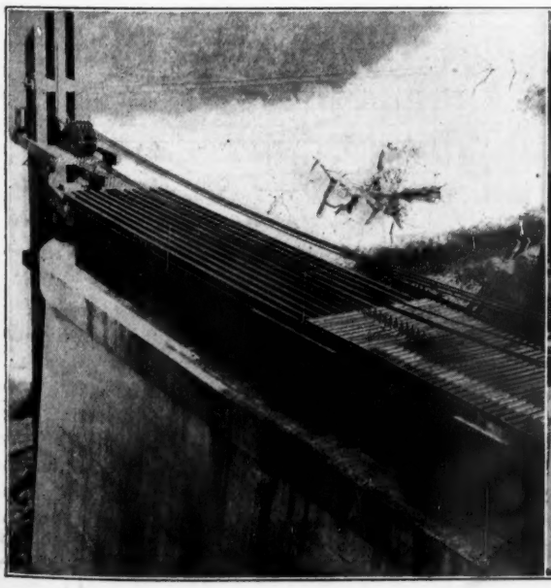
The temporary extension for Pier No. 2 consisted of 98 50-ft. piles, spaced about 2 ft. 6 in. center to center and cut off at ordinary water level. A crib of 4-in. sheeting tied and strutted by 12-in. x 12-in. timbers, and carried from about 4 ft. below the bed of the stream, enclosed the projecting ends of the piles and was filled with sand. The piling and sand were surmounted by a concrete mat 4 ft. thick reinforced longitudinally and transversely by old rails. This formed a temporary pier 42 ft. long by 18 ft. wide. The abutment extensions and that for Pier No. 1 consisted of a concrete mat similar to that described above, without any piling. These temporary supports were built at the same time as the masonry.

On the temporary supports were set 16 framed bents, parallel to the center line of the bridge and anchored to the concrete mat by anchor bolts placed when the concrete was poured. On the caps of these bents were placed 24-in. I-beams, three at the abutments and six at the piers, perpendicular to the line of the bridge, and on these beams were set 10-in. x 12-in. blocking close together; the top of this blocking being at the same elevation as the top of the permanent pier. This constituted the rolling falsework.

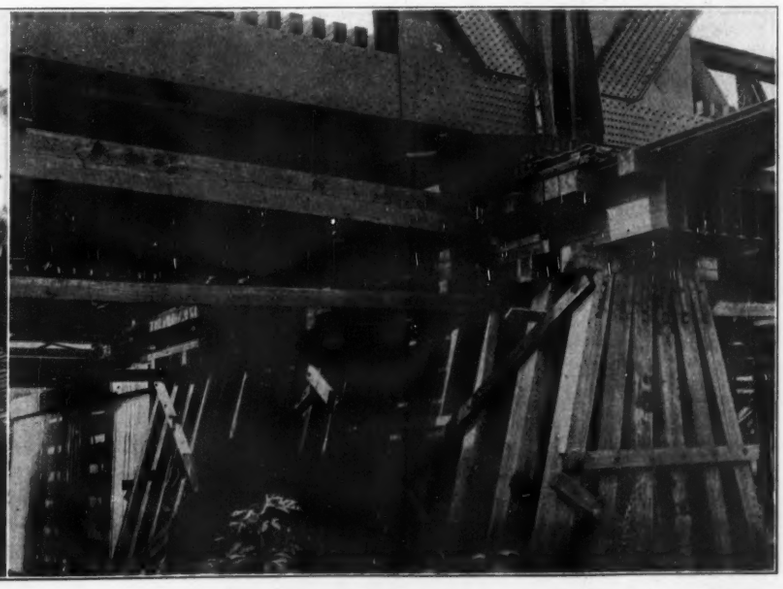
The erection falsework was of the ordinary type, a 12-pile bent at each panel point, driven as two independent 6-pile bents, one under each truss with 6 ft. 6 in. clearance between them, and afterwards braced together.

The pile driver was of a somewhat unusual type designed to drive bents spaced 30 ft. apart without using intermediate bents. It also permitted an entire 6-pile bent to be driven at one setting of the driver. It consisted of a platform about 30 ft. long and 20 ft. wide, with 8-in. x 20-in. side timbers and 12-in. x 12-in. cross timbers. This was mounted on four small flanged wheels under the side timbers, spaced 24 ft. front to rear, moving on rails laid on stringers on the bents already driven. Over the front wheels was set an "A" frame derrick with a 48-ft. boom and over the rear wheels was mounted a hoisting engine and boiler.

A 40-ft. projection was cantilevered in front of the platform by splicing 12-in. x 12-in. timbers to the side beams and trussing these vertically and horizontally to the rear of the platform. On this cantilever was carried a gallows frame at a distance of 32 ft. from the front wheels of the platform. The top of this frame was formed of two 10-in. I-beams spaced 22 in. apart to allow the pile driver leads to move transversely between them on rollers.



Top of New Pier 1 Showing "Deadman," Grillages and Roller Nest



Extension of Pier 1 on Which the New Structure Was Supported Before Moving into Place

The width of the gallows frame permitted the driving of six piles, and when the front wheels of the platform were over the bent last driven, the leads were in position for driving the next bent. The leads were warped across the gallows frame by lines to the winch heads of the engine, and the derrick handled the piling into the leads.

In view of the future moving in of the bridge, the following arrangement for supporting the spans on the rolling falsework was used: On the blocking were placed 85-lb. rails, flange down, 12 on each pier and 6 on each abutment supporting a nest of 201 rollers 2½ in. in diameter, and on the rollers were placed the same number of rails as below, with the flange up. These upper rails supported two sandjacks which carried the new spans by their end floor beams, a sandjack being located under the center line of each track.

The sandjacks used were built up of steel boxes open at bottom and top, measuring 6 ft. x 3 ft. inside at the abutment, and 6 ft. x 6 ft. at the piers where the jacks supported the adjacent ends of two spans. They were about 10 in. deep. A 4-in. cover and a 3-in. bottom of oak fitted closely inside the box which was filled with fine dry sand. The oak bottom rested on the upper rails mentioned above and the cover carried a small I-beam grillage which supported the end floor beams of the new spans. The boxes were thoroughly waterproofed, after being placed, to keep the sand dry.

The function of the sandjacks was to support the spans somewhat higher than their final elevation while being moved into place. This permitted the rails, rollers, etc., to be removed from beneath the trusses and the cast shoes to be set on the grillages. The trusses could then be lowered on to the shoes by allowing the sand to escape through openings in the sides of the box left for this purpose, and normally kept closed.

The new steelwork was handled and erected by a Mitchell 50-ton derrick car; the heaviest single piece, the center section of the bottom chord, weighing about 30 tons. Traffic was diverted over the new bridge in its temporary position on July 14, 1914, a slow order still being maintained over it, and the dismantling of the old bridge was proceeded with. This was completed by September 14, 1914.

The new bridge was moved into place on September 22, 1914, the three spans being moved simultaneously. The motive power was furnished by two derrick cars, located symmetrically about the center of the middle span, and securely anchored about 2 ft. apart.

From the cars four ¾-in. wire ropes were run, one to each pier and abutment, and these, turning downward and sideways around sheaves fastened to the end floor beams, were reeved through a four-sheave block attached to a "deadman" at the upstream end of the pier or abutment and a three-sheave block attached to the new spans, and were finally lashed to the upstream sandjack at their respective pier or abutment. This gave an 8-part line at each of the four points of pull, each line going to a separate drum of the hoisting engines.

Each "deadman" consisted of three 8-in. x 18-in. stringers bolted together, resting on the footing and projecting above the top of the pier or abutment. To this projecting end was fastened the four-sheave block. The lower end was tied on with a wire rope passing round the pier. The adjacent ends of the downstream trusses were fastened loosely together by ½-in. plates, allowing some differential motion in the spans but preserving their relative longitudinal positions.

To ensure uniformity of movement a "telltale" was provided which recorded on a graduated board near the hoisting engines the distance passed over at each point of support, thus making it possible to preserve control over the motion and keep the spans in good alinement as they moved in.

The operation of moving was carried out very successfully. Train No. 11 passed off the bridge in its temporary position at 2:45 p. m. and 10 minutes 17 seconds later the special train carrying B. McKeen, general manager, and his party entered it in its permanent position. The actual time of moving the spans was 6 minutes 50 seconds, during which time seven stops were made to correct the alinement. This left a margin of 4 minutes 27 seconds for track work. A structure of slightly greater length has been moved in this manner, but for weight, distance moved, and time of moving, this operation constituted a record.

The masonry was built by the Foundation Company of New York, under the supervision of the division engineer of the Pittsburgh division. The superstructure, manufactured by the American Bridge Company of New York, and erected by the Seaboard Construction Company, was designed by J. C. Bland, engineer of bridges, Pennsylvania Lines West, and erected under his supervision.

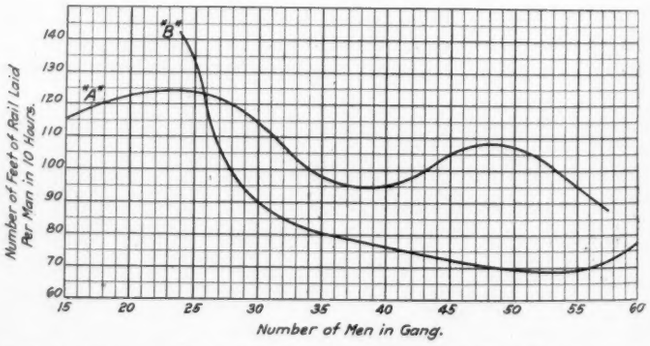
RAIL LAYING

By H. G. Olmstead
Missouri Pacific, Kansas City, Mo.

Rail laying should be started as early in the spring as possible, in order that it can be completed ahead of general track work. By doing this one of the big items going to make up track maintenance will be taken care of, general maintenance, such as tie renewals, ballasting, lining, surfacing, etc., can immediately follow and all track work will be completed early in the fall.

In the unloading of rail for relaying, particular attention must be paid to see that proper lengths are distributed with reference to the needs and to avoid all unnecessary trucking of rails, as this is expensive. Rails should be unloaded from cars with machines, of which there are now several types on the market. With the use of such equipment rail can be unloaded at a cost of 8 cents per rail, while where unloaded by hand the cost will run from 10 to 15 cents per rail. This cost includes work train service and depends somewhat upon the interference with work trains by passing trains. When rails are loaded in box or stock cars end rollers or end skids should be used. In no cases should rails be thrown off cars. A sufficient number of short lengths should be distributed at points where needed, such as curves, yards, street crossings, bridges, etc., as rail should be laid with broken joints, and joints should not be laid closer then 6 ft. from the ends of bridges or from switches.

Proper adzing is one of the most important items in connection with rail laying and should receive a great deal of care and



Relation Between Size of Rail Laying Gangs and Their Performance

supervision on the part of all concerned. Where possible, section forces should be able to do considerable adzing during the winter, which will be a material aid and time saver when rail laying operations are started. All ties should be so adzed that the new rail will have a level bearing on the full width of the tie. When tie plates are used, adzing should be so performed that the entire area of the tie plate will rest on the tie, thus permitting the rail to lay flat and avoid canting. Before laying the rail or applying the tie plates the ties should be swept clean and a coat of hot creosote or other preservative applied.

All joints should be fully bolted and the rail fully spiked. It is preferable to have a small gang following the steel gang so that this work can be kept up to the laying of rail. Then when

the day's work is done all joints are bolted and the rail is fully spiked. The regular section forces should follow and tighten all bolts from time to time.

When considering the size of rail gangs the following diagram shows actual performances. The curve marked "A" shows the amount of rail laid per man for various size gangs. The information was obtained from the daily reports and covers a period of about eight months' work in laying 85-lb. rail 33 ft. long, releasing 56-lb. rail; traffic was light on this line. On the curve marked "B" the traffic was heavier; this work covers about 16 miles of 90-lb. rail which released 75-lb. rail. From these curves it is seen that a gang of 25 men produces the best results.

These curves do not include the application of tie plates, nor lining, surfacing or tie spacing, but only the laying of rail proper. However, they include throwing out the released rail, and the laying of switches complete.

INCREASING THE SCOPE OF THE SECTION FOREMAN'S DUTIES

By E. R. Lewis

Assistant to General Manager, Duluth, South Shore & Atlantic, Duluth, Minn.

In its presentation of this subject last year the track committee of the American Railway Engineering Association stated that "the basic feature is an economic one and the result hoped for seems to be a reduction in maintenance expense by having section foremen do such things as emergency repairs to platforms, stock pens, track bonding, battery renewals, telegraph line repairs, etc., the general idea being to reduce, as far as possible, the expense occasioned by high-priced men moving over the road with great loss of time when only a small amount of work of a simple character is required."

The difficulties of maintaining structures long distances from each other and from bases of supply of labor and materials are recognized and respected by every business man of experience. When the distances become so great and the structures so numerous and so varied in character as the property of a steam railway, the matter of efficient maintenance becomes of much importance to the railway company.

An increase in efficiency in the maintenance of structures, appears to be the primary object of the American Railway Engineering Association in this investigation rather than more work for the section gang. It is argued in the affirmative that the section foreman is the company's representative in charge of a limited mileage of track, and that he is therefore always in position to perform the various duties described, with less delay and expenditure than high-priced men from other departments sent from and returning to division headquarters. This argument implies, as is generally correct, that the foreman artisan and his men are more highly paid than the section foreman and his men.

Arguments in the negative urge "safety first" as good reason for decreasing instead of increasing the scope of the section foreman's duties; for keeping him and his men working continuously together, maintaining the tracks; for on the constant vigilance and the "stitch in time" of the section force depends the safety of each moving wheel. It is further urged that there is serious doubt regarding the ability of track foremen and laborers to properly perform the duties of high-priced artisans even when the work is simple. There is the further difficulty of delegating authority to the section foreman by officers of other departments and the question of whose work should take precedence.

The preponderance of argument on the subject as stated, under present conditions of railway labor and organization, appears to indicate that the nays have it. But there is a possibility that the subject has not been stated fully, that the arguments are incomplete, and that present conditions admit of alterations for the better, and in favor of the increase in efficiency which should result from localized maintenance. American education has for more than three decades, and until the last few years, been increasingly along special lines. America is known among nations as the home of the specialist, the mecca of the inventor, the asylum of the enthusiast, be his monomania what it may. Any American who has taken abroad American enthusiasms, American methods, American arguments, jealously guarded for fear of infringement, has probably been shocked at the impenetrable frigidity with which his cherished ideas have been received. The specialist of America is an American specialty. His education is employed largely as a means to an immediate end, or as an agency to very early business opportunity. The personnel of railway staffs is largely composed of men who have gained their education, their knowledge of their work, and of life, wholly or in part through their own personal efforts, by spare time study and daily experience in the ranks of employees, who have risen as their qualifications allowed, step by step. That such close practical knowledge of details is the best information a railway foreman or officer can have, there seems no doubt. But special subject knowledge has perforce a restricted scope. If it could be preceded by liberal and thorough education over a broader course, the specialist who has risen through one certain department would be a better general foreman or officer. It is feasible to teach an employee of any department the details of the work of employees of the several departments, while keeping him steadily employed. It seems well worth the while of a railway company to so instruct men, in order that they may, as foremen of roadway, take up the broad responsibilities indicated as those which should be undertaken by foremen of the maintenance department.

The section foreman is skilled in track work only. His gang is composed of similarly skilled laborers. They are specialists in their own trade. If any doubt the statement, let him read the rule book, look over the foreman's bulletins, glance through the foreman's diary and follow the gang through the one day's work. I venture to say he will admit that he has had "a rather full day." Until it is generally understood by all concerned that the trackman is a skilled laborer, with all that such recognition implies, the problem of retaining track labor bids fair to remain in part unsolved. The signal maintainer, the bridge foreman, the building foreman, the telegraph lineman, are likewise all specialists. Education must precede the installation of foremen of roadway, if the creation of such foremanship is to be successful. It must not be too short a course, and candidates for entrance should be carefully selected and as carefully and patiently trained. It is said with truth that the problem is largely local with the individual road. The principle, however, is not local.

The basing of the specialist's education on the broad foundation of general knowledge is a nation-wide necessity. There seems danger in so presenting this subject that railway managements may take it up on the basis of expectation of immediate drastic reductions in labor costs. Time, attention and money are necessary to get the desired results. Inducements must be offered before candidates will be found to undertake the roadway foreman's work. A man capable of overseeing artisans, even when the work done is comparatively simple, is worthy of his hire. If he is to further oversee the track work of his section, his knowledge, responsibilities and emoluments should be extended. The writer is of the opinion that the foreman of roadway should be the direct superior of the section foreman; a trackman reporting to the roadmaster or assistant roadmaster; and that he should have supervision over the maintenance of a section of track, as well as over such items of maintenance of other structures on his section as may be delegated to him from time to time.

The evident intention of having the actual maintenance of

structures other than track performed by track laborers will at first meet with disapproval in most trials. The men as well as the foremen need educating. Tools are needed. Material is needed. It may be found feasible to keep a handyman or two in each section gang who may assist the roadway foreman when required. Taking a man or two from a section gang is by no means so serious as taking the foreman.

There seem fair grounds to consider, too, local purchase of both labor and materials, and for small contract work under the authority and supervision of a foreman of roadway. Labor cost is less than half the total cost of building repairs. The transportation of materials and tools from and to division headquarters is quite as serious a matter as the traveling time and personal expenses of artisans. Even the purchase of materials in small quantities at way stations at prices higher than those quoted by the purchasing department is often justified, when risk of damage, delay, cost of handling and the expense for transportation are considered.

Is there any more reason why a pane of glass and a small amount of putty should be shipped from division headquarters to a distant way station depot, than that a glazier should spend a night on a train in order to install the glass and take the next train back? Why not purchase the material locally, have the town glazier put it in and allow the company's local agent to pay the bill? Would not this be both cheaper and better than to have the section gang mark time while the foreman installs the glass?

But of course the purchasing agent and the auditor—quite so. But these matters may be put within the discretion of the foreman of roadway. The agent may be allowed to obtain for him wire authority for the material, labor and expenditure. The agent is the company's local treasurer and may be given authority to pay such bills promptly. If old methods must be altered and precedents established in order to increase efficiency, should not the old routine be eliminated and business done by the shortest, cheapest and best methods?

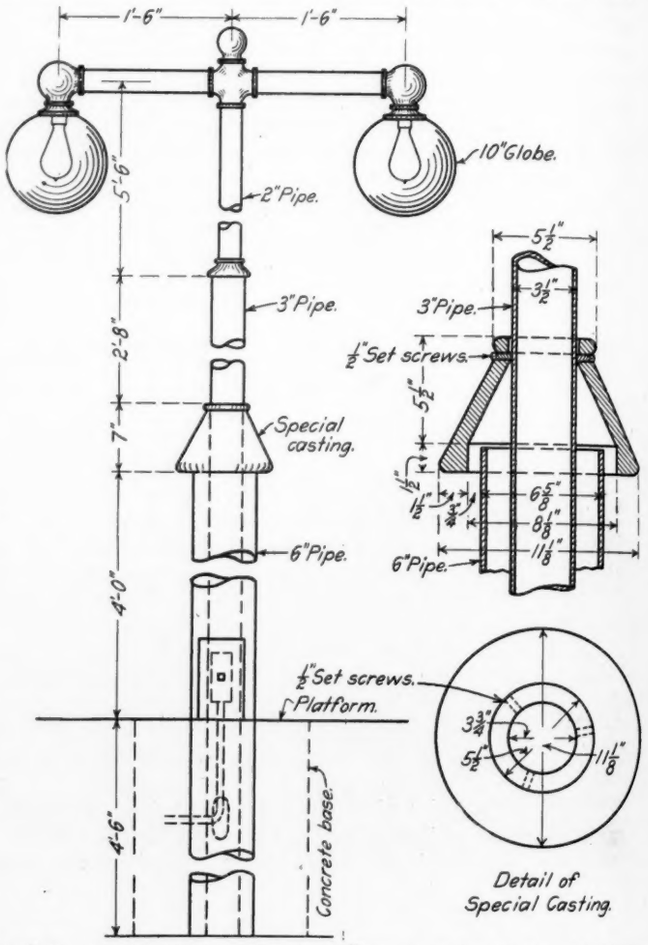
The proof of the pudding is in the eating. The best proof in this discussion is practical application. There are among the employees of every railway one or more men available who are capable of at once assuming the duties of foremen of roadway. The door is thus open for all to immediate small economy which may have far reaching results.

A SHOCK-ABSORBING CAST IRON LAMP POST

The Chicago, Milwaukee & St. Paul has used for a number of years a station platform lamp post made up of sections of standard sized, black cast iron pipe wherever electric power was available. These posts have proved fairly satisfactory, but in some cases the replacement of the globes and lights broken by the impact of baggage and express trucks striking the posts has been an item of considerable expense. This has been especially true on island platforms where the posts are set in the center and the trucking space on each side is limited.

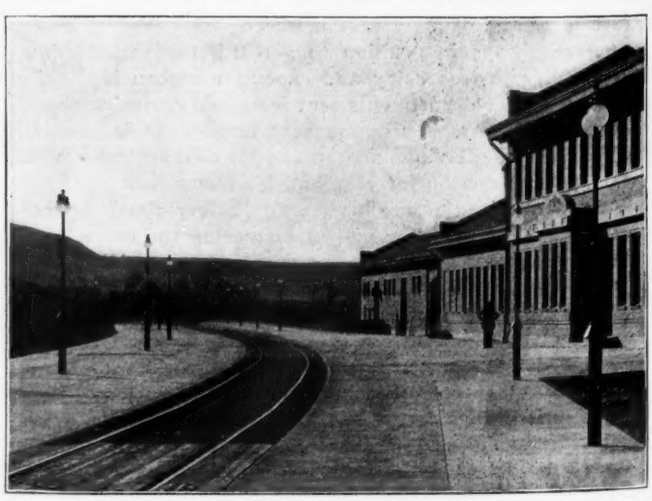
After trying several schemes to eliminate this objectionable feature, it was found that when the lamp post proper is placed inside and entirely independent of a larger pipe extending some distance above the platform this outside pipe will absorb any shock received from trucks and will not transfer it to the lamp post, the lamps and globes therefore remaining unharmed. The improved post as used at a number of points recently is shown in the accompanying drawing, and the installation at Lewiston, Mont., where both side and island platform lights were required, is illustrated herewith. The 3-in. pipe which forms the lower section of the lamp post is set inside a 6-in. protective pipe and extends 4 ft. 1½ in. above the platform. Both pipes are embedded in concrete for a length of 4 ft. 6 in. below the platform level and the space between the two pipes is filled with cement mortar up to that level in order to give the larger pipe sufficient rigidity to enable it to act as a cantilever in absorbing shocks. In setting the posts it has been found desirable to place them before the platform is built, so that the joint at the platform line will be as solid as possible.

The top of the outer pipe is covered by a special casting, uniform in appearance with the standard reducing coupling used



Details of C. M. & St. P. Standard Lamp Post for Station Platform Lighting

between the 2-in. and 3-in. sections of pipe about half way up the post. This casting is slipped over the 3-in. pipe and held in place by three ½-in. set screws with its lower end covering the



A Recent Installation of a Shock Absorbing Lamp Post Design at Lewistown, Mont.

end of the 6-in. pipe. An annular space of ¾ in. is provided between the casting and the pipe to allow for free vibration when the outer pipe is struck. We are indebted for the information contained herein to C. F. Loweth, chief engineer.

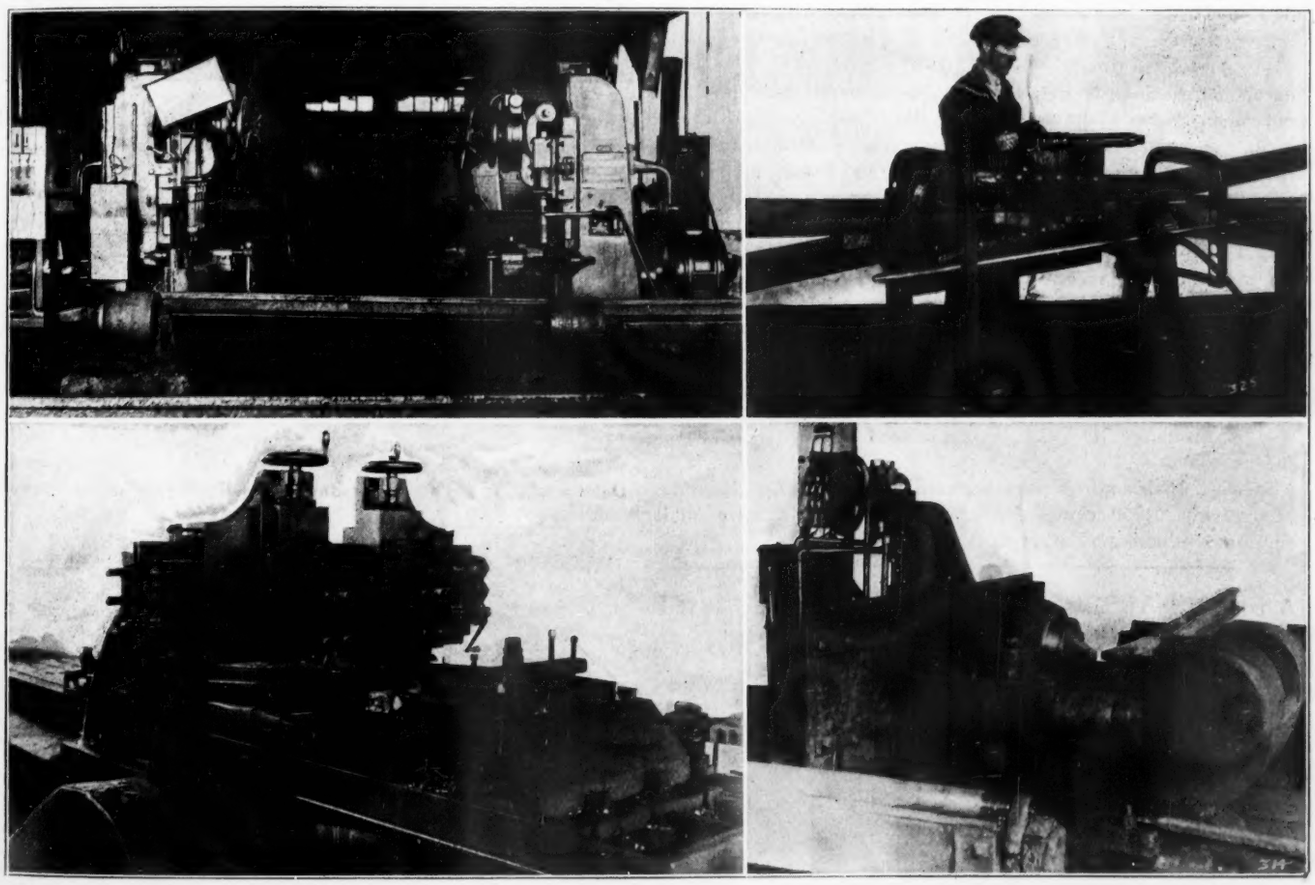
Norfolk & Western Frog and Switch Shop at Roanoke

Practically all Frogs, Crossings, Switches and Guard Rails Normally Required by the Road are Made at this Point

The Norfolk & Wetsern maintains a frog and switch shop at Roanoke, Va., at which are manufactured practically all of the frogs, crossings, switches and guard rails required on this road, and in addition repairs are made to motor cars, track jacks, drills and other track tools, switchstands, frogs, etc. The continuation and extension of the work handled at this plant is the best indication of its success, both as a means of reducing the cost of manufacture and repairs of the parts handled and of increasing the facility with which the maintenance work can be carried on by providing a supply of this material regulated closely to the demand. As an indication of the latter advantage, any standard frog or switch can be secured out of stock without any delay, and in general, a special frog or crossing can be finished in three days.

The frog and switch shop is a part of the road's general shops throughout the other shops where the equipment and material can best be assembled. The shop is in charge of a superintendent, H. J. Sauter, reporting to the superintendent of shops, and employs an average working force of 50 men. The monthly capacity in frogs, switches and guard rails is 150 each. The record for a year ending with a recent month showed that 677 rigid frogs, 702 spring frogs, 1,309 switches and 996 guard rails had been manufactured, while 50 motor cars, 18 hydraulic jacks, 193 track jacks, 12,654 track tools, 44 track drills, 337 switchstands and 20 frogs had been repaired.

The rail mill is operated by 15 men who handle the rail from storage over the skids to the shop where the ends are sawed and chipped and new holes drilled, after which it is classified in the yard and loaded on cars for delivery to relaying points or piled for storage. The average daily output of this plant is 450 85-lb.



Above—Two Three-Spindle Drill Presses for Redrilling Relaying Rails
Below—A Planer Working on Frog Tongue Rails

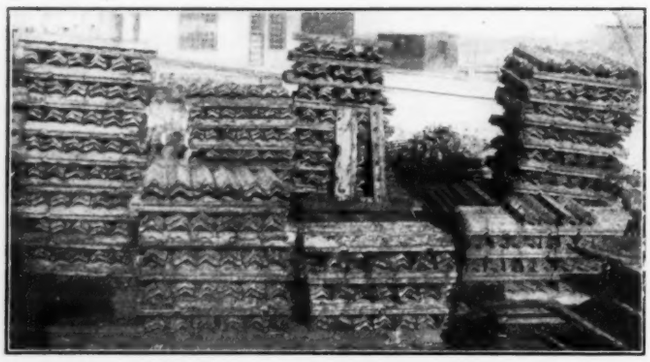
Above—Assembling and Riveting Together the Parts of a Frog
Below—An 80-Ton Hydraulic Rail Bender

at Roanoke which allows advantage to be taken of facilities in other departments and modifies to a certain extent the equipment necessary. The frog and switch shop building is 72 ft. by 192 ft. in size, with an ample area for the storage and classification of rail adjacent to the building, as shown in one of the accompanying illustrations. The main building is used for the manufacture of frogs, crossings, switches and guard rails, an addition next to the rail yard is used for the sawing and redrilling of rails taken from main tracks, and the repairs to motor cars, tools, switchstands, etc., as well as the reclaiming of angle bars, spikes, track bolts, etc., are handled at various other points

rails in eight hours. Rails are loaded and unloaded by a 20-ton locomotive crane with a magnet, having a capacity of approximately 900 tons per day of nine hours. The rails are sawed by a friction saw, which was manufactured at the Roanoke shops, driven by an 80-hp. motor at a speed of 2,700 r. p. m., and having a capacity of sawing 85-lb. rail (one cut) in 12 seconds. The rails are redrilled by two three-spindle, motor driven rail drill presses having a capacity each of 1,350 holes in eight hours. These drill presses are shown in one of the accompanying illustrations.

The rails, plates, filler blocks, etc., used in the manufacture of

frogs, crossings, switches and guard rails are unloaded on the storage skids when received and taken into the main shop building as required. In this building are located all the machines needed for sawing, bending, shearing, drilling and planing the rails, and ample space is provided for assembling the frogs and crossings and riveting the parts together. A cold cut-off saw is used for making either straight or angle cuts of rails and a saw-

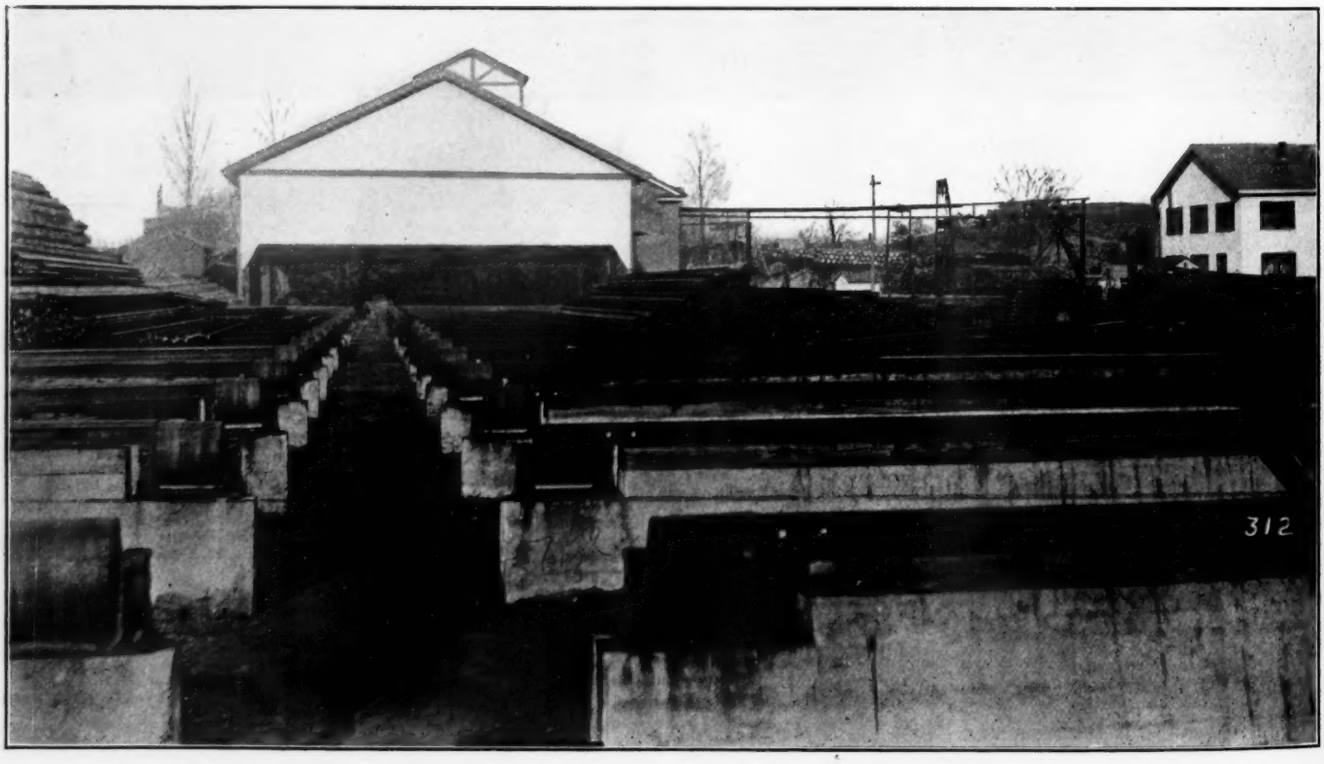


A Pile of Reclaimed Angle Bars Illustrating the Possible Saving from Scrap

sharpening machine is included in the equipment. The rails are bent in an 80-ton hydraulic machine illustrated herewith. This machine is operated by three men and requires 30 min. to bend the rails complete for an 85-lb. rigid frog, and 7 min. for an 85-lb. switch or a set of 85-lb. guard rails. The rail-base shearing machine is operated by two men, shearing the rails complete for a rigid frog or a set of guard rails in 5 min., and for a spring frog in 3 min. The rivet holes in rail bases and plates are drilled by a 36-in. drill press. The planing of rails is handled by a 48-in. draw cut shaper and three planers. One of the operations, for which the shaper is used, the shaping of planer tool clearance in frog tongue rails, requires 8 min. The planer shown in one of the accompanying illustrations requires 1 hr. and 48 min. to plane the four frog tongue rails on which it is working. One of the other planers can finish two 100-lb. 18-ft. switchpoints in 1 hr. and 54 min. Three holes in the web of a frog rail can be punched by a punch and shear in 3 min. A swinging grinder and pneu-

A Pile of Completed Frogs in Stock, Showing Typical Spring and Rigid Frogs of the Types Manufactured at Roanoke

matic chipping hammer is used for finishing switchpoints, this operation requiring 5 min. All frogs and switches are riveted in preference to bolting, the assembly of a frog being shown in one of the accompanying illustrations where 50 rivets are being applied, including the reaming of the holes, in 50 minutes by 2 men. The frog tongues can be riveted together by a yoke riveter in 5 min. Air hoists are provided throughout the shop for the handling of the heavy material and careful study is given to the sequence of operations to eliminate as much handling as possible.



Rail Classification and Storage Skids, Showing Frog and Switch Shop in Background

The reclaiming of angle bars is handled in the blacksmith shop where old bars sorted from the scrap received at the scrap wharf are heated in an oil furnace and swedged under a drop hammer. This work is done by two men with an average daily output in 8 hours of 170 85-lb. Bonzano bars or 290 85-lb. straight angle bars. The cost for the reclaiming is about $0.15 per pair. Old spikes and track bolts are also sorted from the scrap received, the spikes being straightened by hand on an anvil and the bolts stripped of the nuts and rethreaded. This plant is also handling the reclaiming of bar iron by rerolling to standard sizes the miscellaneous material sorted from the scrap. These scrap reclaiming rolls are operated by five men, turning out an average of 5 tons in 8 hours. A washer-making machine installed near the scrap wharf and operated by one man has a daily capacity of approximately 2,500 lb. of assorted size washers, the material for which is secured from the miscellaneous scrap. A rivet-making machine and furnace operated by two men has a capacity of 30,000 rivets in 8 hours.

In the repair of track drills all parts are ordered from the manufacturer, the drill being given a through overhauling and put back in service practically as good as new. In the repair of frogs, the old plates, spring boxes, reinforcing bars, etc., are used, thus saving a large amount of material from scrap and considerably reducing the cost. All old track tools are repaired that have the eyes left in them. All the parts needed in the repair of switchstands are made in the shop with the exception of the malleable and cast steel parts.

We are indebted to A. C. Needles, general manager, for the above information.

THE VALUE OF NEATNESS

BY AN EX-SECTION FOREMAN

While the subject of economy in railroad operation has received wide discussion during recent years, very little attention seems to have been given in these discussions to everyday neatness. Neatness is a fundamental quality in all economical operations. The house-wife who is so overworked or harassed with other duties as to be unable to keep the home in orderly condition, or who for reasons of education and environment is lacking in knowledge of the essentials of neatness, is found to be

Fig. 1—Exterior of an Untidy Tool House

the one who is also wasteful and extravagant in the use of supplies. So it is with many railroad employees whose duties have to do with the use of materials and supplies, and who are kept so busy with their routine work that they never seem to find time to tidy up the premises. There are many others who lack the proper instructions and supervision necessary to enable them to make economical use of the company's property intrusted to their care.

One of the larger railroad systems operating out of Chicago, recently conducted a general campaign on neatness, the pleasing effect in improvement of station buildings and station grounds being at once very noticeable to the public. At the same time, a quantity of serviceable supplies, such as lamps, lanterns, oil cans and similar items were returned to the division storehouses as surplus collected from these stations. In connection with the

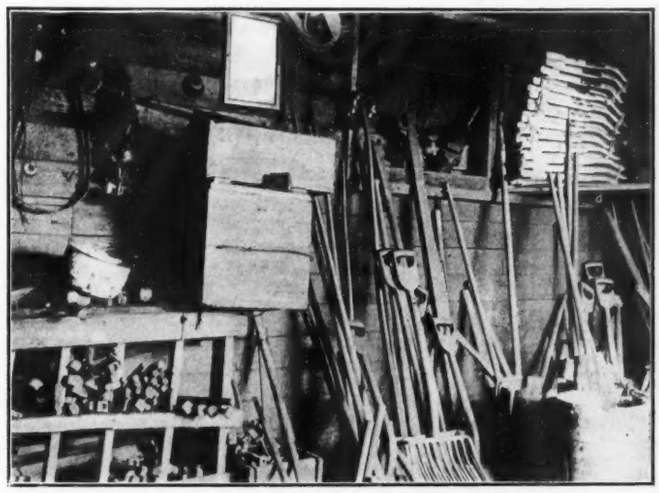


Fig. 2—Interior of the Same Untidy Tool House

same campaign which was extended to division offices, switching yards, and all other points on the system, the section tool houses were given a thorough straightening up.

Unfortunately the general idea seems to prevail that it is not necessary to keep a section tool house in neat condition. Frequently the tools are tossed in a heap on the floor at the close of the day's work and new material, when received, is shoved into a back corner until needed. It seems so easy and natural to allow the tool house to remain in a disorderly, untidy condition that material becomes damaged from long exposure to the weather, and tools and supplies are mislaid and cannot be found when wanted.

The railroad referred to above has a published list of equipment standard for each section tool house. It also operates sup-

Fig. 3—Exterior of a Neatly Kept Tool House

ply cars which are supposed to keep this matter checked up on each trip. Neatness, however, had been a secondary consideration, if thought of at all. There was therefore much work required to straighten up many of the tool houses and surrounding grounds and to remove the tools and material which was so evidently a surplus, once the stock was in neat, tidy condition.

The illustrations show in Figs. 1 and 2 the condition of a section tool house no worse than may be found on any large rail-

road system. When the order came out to "clean up" the following items were found in this house which were not required by the force employed:

24 new track shovels.	1 clamp for a rail drill.
7 old track shovels.	14 tamping picks.
5 ballast forks.	4 tamping bars.
1,000 new nutlocks.	7 lantern frames.
36 torpedoes.	5 kegs track spikes.
60 frog bolts.	4 switch head rods.
1½ kegs of track bolts.	240 tie plates.
5 track chisels.	5 compromise rail joints
3 spike mauls.	19,000 lb. of track scrap.

Credit amounting to $192.37 was allowed for this surplus when returned to the storehouse and the tool house was left in such condition as to be readily checked up by the roadmaster or supply car clerk.

On the same district, there is located the tool house shown in Figs. 3 and 4. This is an ordinary tool house, no expense having

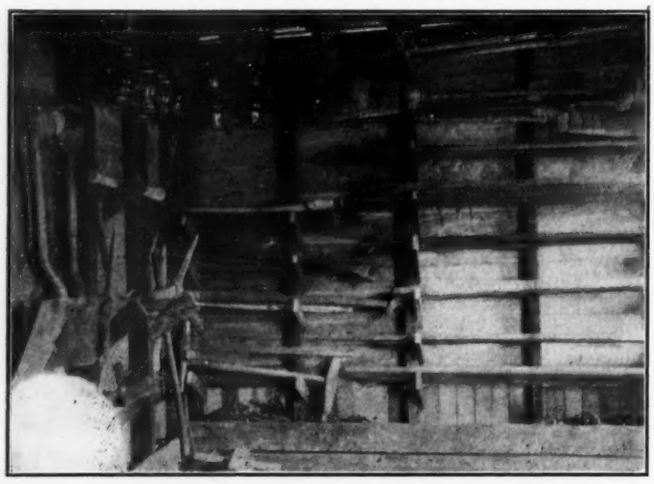


Fig. 4—Interior of the Neatly Kept Tool House

been incurred in fitting it up with the bins, racks or cupboards which are such a help in keeping a tool house in orderly condition. The section foreman, however, was naturally neat and careful, and the illustrations show the orderly manner in which his tools were kept. Only a few moments were required to check over the contents of this tool house and no surplus articles of any kind were found therein.

The lessons in neatness taught employees on the railroad system referred to, have proven the longest step in the direction of economy which this railroad has ever made. Where a place is kept in neat systematic order, surplus of any kind becomes at once noticeable, and by being properly disposed of, it becomes an asset in taking care of actual wants in other localities.

MAKING BRICK WITHOUT CLAY

A new process of making brick which is not dependent upon the presence of so-called natural brick clay has been invented by A. Malinovszky, a ceramic chemist, and a plant to manufacture brick according to this process is now being built at Lincoln, Ill. The process consists of combining chemically any coarse material containing silica with a binder of finely divided particles of alumina, silica, potassium or sodium in proportions varying with the different substances and which may be determined by chemical analyses for each supply of material. One of the purposes of this process is to obtain a low fusing point for the binder and a relatively high fusing point for the coarse material. The material is molded, preferably dry, under high pressure and is fired in a manner similar to that used in the manufacture of ordinary brick. The process of firing, however, requires a much shorter period, usually two or three days in an ordinary down-draft kiln. It is proposed to utilize tailings from coal mines at the new plant at Lincoln, and it is stated that on account of the wide variety of materials which can be used, including the by-products of many industries, the process should be applicable in many localities where ordinary brick cannot be made on account of a lack of deposits of good brick clay.

The bricks manufactured by the new process have been repeatedly tested and analyzed. In one test conducted by Robert W. Hunt & Co., an absorption varying from 1.66 to 2.75 per cent was found, and after this absorption test the brick withstood a temperature of 0 to 10 deg. F. for 48 hours and a five-hour exposure to a temperature ranging up to 2,900 deg. F. without cracking or showing apparent damage. A crushing test of the brick conducted at the University of Illinois showed a unit compressive strength of approximately 20,000 lb. per sq. in. Microscopic examinations made by Professor Rollin D. Salisbury, geologist, University of Chicago, have indicated that the texture of the brick is such as to make possible a high polish and the grain is so fine and even that clean cut lettering and carving should be possible.

The American Brick Company, Lincoln, Ill., owns the patent rights on this process and is at present engaged in the construction of a plant at that point.

SUGGESTIONS FOR A BOOK OF RULES FOR THE MAINTENANCE OF WAY DEPARTMENT, EMBODYING THE SAFETY FIRST IDEA

By J. T. Bowser

Maintenance of Way Department, Queen & Crescent Route, Danville, Ky.

Assuming that the organization of maintenance of way employees into safety committees or other similar organizations is impracticable on account of the manner in which they are scattered over the entire length of the road, some other means must be used to reach them and imbue them with the Safety First spirit. This can be done to some extent by correspondence, safety buttons, signs and personal instructions by supervising officials, but these at best are intermittent or of but temporary effect. The following rules are offered as a basis for a printed book or pamphlet to be placed in the hands of every foreman or other responsible employee in the department. For practical use they would, of course, have to be varied to meet conditions or conflicting clauses in the current book of rules.

General

(1) It is the duty of all employees to watch for, and to report to their superior officers, all matters involving the safety of employees and the public.

(2) When it can be done without neglect of other duties, employees will warn off trespassers or others whose duties do not require their presence on the right of way or tracks.

(3) General instructions concerning safe practices must be posted in tool houses or camp cars where they can be seen by employees, and employees should be required to read such instructions.

Supervision

(4) Employees entering the service are required to read or have read to them outstanding instructions or rules involving their own safety or that of others.

(5) Foremen working on double track will require their men to step off of both tracks while trains are passing.

(6) Foremen are required to stay with their gangs at all times, to keep watch for trains and to see that their men perform their work in such a manner that neither their own safety nor that of others is endangered.

(7) Yard foremen or others in charge of men working in places where the passage of engines or cars is very frequent, are prohibited from taking part in the work at hand or performing any other work which will prevent their keeping a proper lookout for trains or cars, unless they assign some responsible man to keep such a lookout.

(8) Men having defective sight or hearing or men who are habitually careless in their work are not considered desirable employees and must not be retained in the service.

(9) The use of gauntleted gloves by employees handling heavy material is prohibited.

(10) Except in cases of emergency, classes of work usually handled by other employees must not be required of employees not familiar with that class of work. (This applies particularly to handling of equipment and electrical work.)

(11) Under no conditions must high tension electric power wires be handled by other employees than those whose duties require them to look

after such matters. In cases of the breakage of such wires, a watchman should be left at such break until the arrival of the proper person to make repairs.

CLEARANCES AND BAD FOOTING

(12) Except on explicit instructions from proper authority, no track will be laid, nor will any structure be erected, which will not give ample clearance to a man on the side of a car.

(13) When conditions necessitate the construction of a structure or track which does not afford proper clearance to a man on the side of a car, a warning sign giving proper notice of this condition must be posted and maintained at a point where trainmen or others cannot fail to see it.

(14) When it is necessary to obstruct or in any manner change the nature of the ground where trainmen or others habitually walk or alight from trains, the despatcher or other proper authority must be advised so that notice to this effect may be put out.

(15) When it is necessary to make any radical change in tracks, structures or appliances in habitual use, proper authorities must be notified so that notice to this effect may be issued.

(16) Excavations left over night must be protected by railings, and temporary obstructions of any nature must be protected at night by red lights when this can be done without danger of such lights being confused with signals for train operation.

HAND CARS, PUSH CARS, MOTOR CARS AND VELOCIPEDES

(17) Track foremen will not permit the use, on their sections, of hand, motor, push, or velocipede cars, by others than those whose duties require the use of such cars or those having written permission from a proper authority.

(18) The use of cars for other purposes than the performance of duties is prohibited.

(19) Cars will not be used except when in charge of a foreman or a competent assistant.

(20) When passing trains on double track cars must be set off of both tracks.

(21) Where operators, 'phones or other means of communicating with the despatcher are available, foremen will obtain line-ups on trains before going out with cars.

(22) Foremen will protect their cars by flag when passing through tunnels or over portions of the line where trains cannot be seen for a sufficient distance to enable cars to be set off.

(23) The use of hand cars with wooden handles is prohibited.

(24) Foremen will not carry, or permit to be carried on their cars, any one not an employee of the company or any employee whose duty does not require the use of the car.

USE OF LOCOMOTIVES OR TRAINS

(25) Employees in the maintenance of way department are prohibited from riding on locomotives. (This applies to work trains as well as other trains.)

(26) Except in the performance of their duties, employees in the maintenance of way department are prohibited from swinging upon or riding on trains or cars.

CAMP CARS

(27) When camp cars are to remain at one station a week or more they must be spurred out or otherwise protected from trains or cars.

(28) All movable articles in camp cars must be fastened down or otherwise prevented from moving when cars are to be handled.

(29) Heavy tools or material must not be suspended but must be placed on the floor or otherwise prevented from moving.

(30) Foremen in charge of cars are required to see that steps, hand holds, ladders, etc., are maintained in safe condition.

SPECIAL EQUIPMENT

(31) The responsibility for the maintenance of all special equipment in safe condition lies primarily with the operator, but foremen in charge of work on which such equipment is engaged will make frequent inspection.

(32) Lines, blocks and other apparatus on derricks, hoisting engines, etc., must be thoroughly inspected and tested before being used after the machine has been out of the service.

(33) In freezing weather all water must be drawn from a boiler at night unless provision is made to keep it hot, and when equipment is to be stored, water must be drawn from boilers regardless of weather conditions.

ROAD CROSSINGS, GATES AND FENCES

(34) It is the duty of section foremen to see that all grade crossings are maintained in a safe and passable condition, especial care being exercised during the automobile season.

(35) Section foremen will keep cleared away from crossings weeds or other obstructions which prevent a clear view of approaching trains.

(36) All employees will close gates in right of way fences when they are found open and will endeavor to have parties who use these gates keep them closed.

(37) Foremen will look out for breaks in the right of way fences or other conditions which will permit the entrance of stock onto the right of way and will remedy such conditions or will report them to the proper authority.

INSPECTION AND USE OF TOOLS

(38) Foremen will satisfy themselves daily that all tools used by the men under their supervision are in safe condition, and they will prohibit the use of tools found to be defective.

(39) The use of jacks on the inside of the rail is prohibited.

(40) Tools must be removed from between the rails or from points close to the track while engines or cars are passing.

(41) Tools not in use must be kept picked up and placed where they will not be an obstruction.

SCAFFOLDING

(42) Foremen in charge of work which requires scaffolding will personally inspect all material to be used in the scaffolds and satisfy themselves that such material is entirely safe for use.

(43) Foremen will personally oversee the construction of scaffolding and will see that a safe construction is used. During the use of the scaffolds foremen will see that they are not overloaded.

(44) The use of scaffolds by employees or others whose duties do not require it, is prohibited.

(45) Runways or ladders must not be located under scaffolds or at other points where tools or material are likely to fall, and where a considerable amount of work is to be done, temporary railings must be erected to keep men from going beneath them.

(46) Cable and tackle scaffolds which have been stored or shipped must be thoroughly tested for deterioration or injury before being used.

LOADING AND UNLOADING MATERIAL

(47) Cars must not be loaded beyond marked capacity and top-heavy loading must be avoided.

(48) Forement will inspect all material to be used for standards or stakes and will see that they are securely applied. Properly braced end boards must be applied where rails or similar material is loaded on flat cars.

(49) Rails will be loaded by machine where possible, but when necessary to load by hand the following precautions must be observed: (A) Divide the gang equally on the ends of the rail; (B) Do not attempt to throw rail unless an ample force is at hand to throw it clear; (C) designate one man to call directions and prohibit others from calling; (D) do not attempt to load where men cannot get away readily should the rail fall back.

(50) Loading must be discontinued while trains or cars are passing on adjoining tracks.

(51) When unloading material a lookout must be placed to warn persons passing the car.

(52) Material should not be unloaded from both sides of a car but from each side equally. The same principle applies to loading material.

(53) Men should be called out of the cars when material is being dragged out of hopper bottom cars and should not be permitted to remain in any car while it is being switched.

HANDLING OF EXPLOSIVES

(54) The use of torpedo signals on station grounds is prohibited.

(55) The storage of dynamite of other explosives in tool houses or camp cars is prohibited.

(56) All shipments of explosives must be made in accordance with the rulings of the Bureau for the Safe Transportation of Explosives.

(57) The use of explosives by others than experienced men is prohibited.

(58) Charges which fail to explode must not be approached until the expiration of ten minutes and they should be removed only by experienced men. All others must remain at a safe distance.

(59) Explosives must be drawn from the magazine only as required and must not be left on the work under any condition.

THE PACKING OF ICE

During the past year the Atchison, Topeka & Santa Fe has been conducting experiments at several ice houses on the Oklahoma division with different materials used in the packing of ice and noting the shrinkage resulting. At Arkansas City, Kan., 406 tons of ice were packed in sawdust at an average cost per ton for labor and material of approximately $0.40. At Purcell, Okla., 502 tons were packed in paper at a total cost per ton for labor and material of $0.31. At Arkansas City 60 tons, or 15 per cent, were lost by shrinkage, while at Purcell the shrinkage amounted to 128 tons or approximately 25 per cent. At Shawnee, Okla., where paper was also used, the results were more unsatisfactory, although conditions at the latter point were not strictly comparable with those at the two other stations, as the ice was carried for a longer period and the insulation of the house was not in good condition. These tests have indicated, however, that the use of sawdust is more effective than paper in the prevention of shrinkage and more than offsets the difference in the cost of packing.

NAPHTHA FUEL FOR GALICIAN RAILWAYS.—It is reported that the Russian railway authorities in Galicia propose to utilize the local naphtha fuel for locomotives.

ACCOUNTING FOR RAIL AND TIES*

By Charles E. Parks
Superintendent's Office, Atchison, Topeka & Santa Fe, Winslow, Ariz.

In construction, addition and betterment work rail and ties constitute a large item of expense; while, in ordinary maintenance work, ties themselves form perhaps the largest single item with the exception of track labor. Naturally, when a railroad spends thousands and sometimes millions of dollars annually for such material, a strict account of it is desirable.

For all purposes rail may be considered as practically indestructible, either in track or out. Ties are perishable and no attempt is made to account for them once they have been used. Unlike rail, they have no value as second-hand material for accounting purposes. It is necessary to account for all rail upon a division, and a record must be kept of it from the time it is received to the time it is shipped away as scrap. This record is a history of the purposes for which it is used. All rail on a division is classed under three heads: (1) Rail charged out; that is, rail inserted in tracks and capitalized; (2) rail in temporary tracks; and (3) rail on hand. Under each of these heads it is still further classified, first, as to condition, whether new or second-hand, and, second, as to weight.

In this complicated classification many errors and discrepancies will arise, discrepancies of such a nature that they can be adjusted only by arbitrary methods. It is for this reason that accounting for rail is so difficult. To anyone even slightly familiar with rail accounting three well defined avenues of error become at once apparent: First, errors as to the quantity of rail reported; second, errors as to the class of rail reported; third, the error of not reporting at all.

The quantity of rail is reported in lineal feet, or sometimes in tons; but, as the lineal feet must be known before the tons can be arrived at, the former is the primal factor. In reporting rail, it therefore is necessary to measure each rail length or compare other rails with rails of known length. In this the error lies in mistakes of measurement, which may be due to a hundred causes. Errors as to the class of steel are more numerous. Such errors are not always the result of carelessness or negligence, but are more often mistakes of judgment. To illustrate:

A section foreman reports a carload of rail as shipped. He submits a statement showing the quantity of each class of steel in the car. The rail is received on another section, perhaps on another district or even division; but the statement which the receiving foreman submits as indicating the amount and class of rail received is entirely different from the amount shown as shipped. In an endeavor to adjust the matter a re-check of the rail is made, but this count is entirely different from either statements.

An extra gang is laying a temporary track. When the track is completed the timekeeper submits a form showing the exact amount of rail laid. A few months later the track is taken up. But both the class and quantity of rail reported taken up differs greatly from the class and quantity originally reported laid, and we have no reason to doubt either reporting. These are mistakes of judgment and there are no means of avoiding them.

Errors which come under the third head cause the greatest discrepancies in rail balances. They are more serious because they usually involve large quantities, and if not discovered within a short time, they are seldom detected and must result in an arbitrary adjustment on the rail report or inventory.

No doubt any division which attempts to keep an accurate record of its rail on hand has met with similar difficulties. It has been demonstrated on the Albuquerque division, and no doubt on others, that for the superintendent's office to keep an accurate record of rail on hand from the monthly reporting of section or extra gang foremen was impossible. A few months after the inventory was taken, the sectional rail balances had failed to reflect actual conditions. In fact, more than one-third of the sections were in the red. This state of affairs was accepted by many as being a natural one, the theory being that it was impossible to keep an accurate record of rail by sections. The chances of error being so great it was assumed they could not be overcome. However, an analysis of the discrepancies and red items appearing on the rail report and rail balances month after month disclosed the reasons for these errors, as indicated in a foregoing paragraph. To remedy such conditions and to endeavor to eliminate or reduce to a minimum the mistakes which naturally arise from the accounting of such a highly classified article, a system has been inaugurated on the Albuquerque division of the Santa Fe which involves a close co-operation of men and officers most interested.

To begin with, a reliable and accurate inventory is taken at the beginning of each fiscal year. This inventory is taken primarily by section foremen and includes all rail and ties and such other material as is necessary to be taken which lie within the boundaries of each section. The foremen are usually allowed two days in which to take this inventory and at the same time are assisted by the roadmasters and by the division accountant, who make it a point to travel over the districts for this purpose. The third day the inventory is checked. Each roadmaster, accompanied by some representative of the superintendent's office or the storekeeper, travels over his district, collects the inventory books and checks the entries. Sometimes this check requires three or even four days, but, as accuracy in the inventory is the foundation for rail balances throughout the year, the time is well spent.

As soon as possible after this inventory is taken each section foreman is given a statement showing the amount of rail or ties on his section. This statement also contains the amount of rail in tracks either connected or disconnected. Thereafter, at the end of each month, he is required to report to his roadmaster the amount of rail and ties on hand. The form of this report for rail is as follows:

Section Number 37

Statement of Rail on Hand for the Month of May, 1914

	New	New	Old	Old	Old	Old
	90	85	90	85	75	66
Rail on hand 1st of month.....	450	33	66	900	30	5,000
Rail received during month.....	2,000	..	33	99	..	30
Total	2,450	33	99	999	30	5,030
Rail used during month.....	450	..	66	66	..	30
Rail shipped during month.....	..	..	..	900	..	5,000
Balance on hand end month..	2,000	33	33	33	30	..

.....
Foreman

This is a mimeograph form sent out by the superintendent's office and is rendered by section foremen in addition to the regular report of rail transactions in the time book. In fact, it is rather a recapitulation of all rail transactions which occurred on the foreman's section during the month.

The same procedure is undergone in respect to ties, and a similar form is rendered. However, the accounting for ties is less complicated and the great source of error is the failure to report rather than errors in classification.

The co-operation which is secured by this report is self-evident. It encourages the section foremen to obtain accurate figures and indicates plainly discrepancies which are the result of errors. A foreman has but to take an inventory and he can tell immediately whether his rail reporting has been in error or whether there has been a mistake on the previous inventory. Roadmasters always have first-hand information as to the amount of rail or ties on their sections without waiting for tardy sectional balances from other departments. Superintendents' offices have a means at hand to check instantly any discrepancies or irregularities which may arise.

It might be said that these remarks apply only to divisions engaged upon routine work. Where much construction work is being done or where a large amount of double track is being laid the foregoing procedure will not apply, for it is then a matter more of good luck than of good judgment to keep the rail and tie balances straight.

*From the Santa Fe Magazine, February, 1915.

Promoting the Growth of Vegetation on the Slopes

Methods and Cost of Placing Sod and Various Plants to Prevent Erosion of the Banks and Reduce Maintenance

By W. F. Rench
Supervisor, Pennsylvania Railroad, Tacony, Pa.

It is only within about 15 years that the larger railroad systems have been committed to a definite policy of encouraging the growth of vegetation upon the slopes of cuts and within a still shorter period upon those of embankments. But the results obtained have been so marked that the practice has continued on those roads and has extended to the smaller roads and even to those upon which by reason of a total absence of passenger traffic the matter of appearance is of no special moment. The economy is therefore recognized and the only question is that concerning the type that is preferable for a particular location. To aid in the determination of this question certain types that are of somewhat general application will be discussed in detail.

SODDING

The sodding of slopes of both cuts and embankments is justified by the saving in roadway cleaning alone, aside from the improved appearance of the roadway. In addition, the advantage as a protection against accident may not be fully appreciated. Many maintenance officers have been concerned at some time with the upkeep of a new line. These men appreciate fully the dangers that are inherent in new fills even for long periods after their use is begun. Only in those rare instances where the fill is entirely of rock is there complete security against slipping. The breaking of a new embankment constructed wholly of gravel, during a heavy fall of rain lasting only one-half hour, which resulted in temporary discontinuance of service on the nearest track, is within the recent experience of the writer. Sodding the slopes of the new embankment was then in progress and the completion of this work at the point that failed furnished entire protection against further slipping. As the benefits that may be expected from sodding were fully illustrated in this one operation it will be instructive to review the work briefly.

The piece of road in question is part of a main line carrying a daily traffic of 250 trains. Although the height of the fill averaged 22 ft. for more than three miles service was inaugurated at a speed of 30 miles per hour, which was increased after 36 hours to 50 miles per hour and after one month to 70 miles per hour. The original grading was purposely made wide to provide for the erosion that was expected to occur through the winter, the shoulder of the fill being uniformly 9 ft. from the gage line. By the middle of the succeeding spring it was found that money was available for sodding and this work was prosecuted through the entire summer and fall until a total of 10 acres had been laid. This was possible during the months of July and August, which were very hot and almost rainless, by reason of an unlimited quantity of water being available through the fire hydrants of the city. The sod was all cut from company ground, but half of it had to be shipped from a point 15 miles distant. It was cut in 12 in. squares and was all handled flat. Experience has shown that the percentage of breakage is greater when the sod is cut of a greater dimension or when it is rolled. The sod cutter which effects a saving of two-thirds the labor of cutting by hand was not available for this operation.

The gravel of the fill contained very little loam and it was necessary to apply a covering of top soil. The considerable length of the slope, 40 ft. at the average depth, precluded the delivery of the top soil wholly from the bottom, although it was found practicable to thus supply the lower half of the slope. The upper half was supplied from cars working upon the nearer tracks which at that point were those assigned to passenger traffic but whose use was obtained at proper times. By reason of the great amount of top soil required and in order to occupy the main tracks as little as possible, a minimum thickness was decided upon which was generally 2½ in. This depth proved to be a good choice as practically none of the sod was lost through slipping although no pegging or other support was given. The sod was well rammed as laid and the watering through a 2½ in. hose was done without force. A very small area was lost during a heavy downpour of rain the spring following and this occurred where a depth of 12 in. of soil was used to fill a depression in the slope. It is quite probable if the top soil had been applied of a much greater thickness than 2½ in. there would have been extensive slipping. The need of fertilization for so thin a mold was not overlooked and the entire area was plentifully sprinkled with bone meal the spring succeeding the sodding and care was taken to afford the slope receiving the direct rays of the sun the greater advantage.

A careful account of the expense of this sodding as well as for an equal amount at other points gave an average cost for the sod in place of 1½ cts. per sq. ft. The regrading of the slopes and the addition of the top soil made the average cost of the finished work $1,000 per acre or about 2⅓ cts. per sq. ft. The total expenditure of $10,000 for sodding upon this one operation was warranted alone by the greater security against accident. The cost of mowing the banks, which is necessary about four times during the season, is $9 per acre at each cutting; but this is no more than a periodical regrading of the banks to resist erosion would have cost. There is the further item of attractiveness through the enhanced beauty of the roadway, which is not measurable.

STIMULATING GROWTH BY STREET DIRT

There are many slopes especially of cuts where the expense of sodding is not warranted or this method is impracticable, but where both for appearance and stability, a turf is desirable. It will be a matter of surprise to those who are unacquainted with the efficacy of street dirt fertilization to observe the quick growth that may be obtained by its use. A good turf has been developed in six months, a firm one in a year and two years produces the equivalent of an old sod.

There are certain points to be observed in this culture. On account of its lightness the material is easily washed away and the best results are obtained by applying it after the spring rains are over. If sown with eight bushels to the acre of the mixture given below, an application of this material about June 1 should produce a turf by the middle of September that would ordinarily be proof against the fall rains:

Awnless brome grass	1 bushel
Canadian blue grass	1 bushel
Orchard grass	1 bushel
Herd's grass	1 bushel
Turkestan alfalfa clover	1 peck

Street dirt should not be applied too thickly upon banks. A layer generally 2½ in. deep after all paper and other waste has been taken from it is the most favorable. It is not necessary to regrade the eroded surface of a bank before the street dirt is applied and this fact alone recommends the method where cheapness is a governing requirement. It may be spread as late as the middle of October, but after that time it is apt to be mostly dead leaves and should be allowed to rot in a pile over the winter to be ready for use in the spring. Besides its cheapness this method has been known to develop a growth when all other means have failed. There are cuts upon whose slopes sodding has been tried with every known precaution but without

avail, but which have responded to persistent applications of street dirt plentifully sown with the above mixture. The material may be obtained from contractors for street cleaning in any of the larger cities, loaded upon cars without cost.

HONEYSUCKLE

There are many varieties of this prolific vine but the only one of concern in this discussion is that which trails along the ground and is commonly known as woodbine. It most probably is a garden hybrid of the main family. The woodbine may be grown in any soil either from the root or a cutting. It takes root wherever it touches the ground provided the soil is not too hard. In that event it will not spread but will grow up bushy. The best results are had by planting in March either the roots or sections of the vines set five or six feet apart or closer if a mat is desired more quickly. It grows slowly the first year but faster thereafter and will cover the ground in about three years. The mat then formed will resist any wash. It is superior to sod for preventing unstable soils washing down into the ditches and as a means of retaining a steep slope necessary by reason of insufficient property, is of unequaled utility.

This vine blooms profusely in the early spring and continues a moderate flowering late into the autumn. The blossom is very fragrant and its odor may be caught on passing trains. Areas covered by it require no cutting and there is thus no expense but rather a saving of expense from its propagation. As it retains its moisture late, fires seldom catch in its vicinity.

There are several varieties of summer and autumn flowering perpetual briar roses which by reason of their dwarf habits and their wide and deep rooting characteristics form an excellent means of protecting the slopes both of cuts and embankments, besides supplying the element of beauty that tends to make travel agreeable. The R. Rugosa, or Japan rose, has been much employed upon both kinds of slopes but on account of its somewhat irregular growth it is apt to convey an impression of neglect and is somewhat better suited to fills where its holding advantages alone prevail. The R. Humilis or Lucida, which seldom grows higher than 18 in. and tends more toward uniformity of growth, is the preferable variety for use upon the slopes of cuts since it always presents the appearance of being cultivated even though no care is actually required. Both plants are exceptionally hardy and they may be grown anywhere between Maine and Florida. Their foliage is nearly evergreen but quite late in the fall the leaves turn purple, orange and yellow and they bear a red berry which gives the plants an exceedingly attractive appearance at all times. Like all roses they may be grown in almost any kind of soil except a very loose and sandy one and require little cultivation. They should be set out in the early spring, from 2 to 3 ft. apart and as deep as in the hot house mold. A light covering of street dirt is very effective when growth is being started. These roses can be propagated by seeds but they may also be grown readily in summer under glass from cuttings of nearly ripened wood. A single plant will furnish in several seasons as many as 500 cuttings. The R. Wichuriana, or Memorial rose, a half evergreen shrub with prostrate and creeping branches, and one of the hardiest of trailing perpetual briars, makes a beautiful covering for banks, but does not have as great holding power as the two other roses named. The abhorrence of all roses for continual dampness is well known and their cultivation on wet slopes is therefore not practicable. The New England roads have many miles of roadway planted with roses and the Pennsylvania has been using this protection with success for several years.

ALFALFA

This hardiest of perennial forage plants is cultivated in the most diverse localities, but is especially adapted to land that is neither low lying nor extreme in altitude. It has a large tap root with very few side roots. Its extreme penetrating power renders it a valuable protection against ultimate slipping of the banks but the time required for developing its hardiest growth renders it rather a better selection for older banks. It can only be grown in a fertile soil and the best results are had by developing this feature the year preceding the alfalfa seeding. Common fertilizer will produce a growth of weeds which must be destroyed before they reseed as these greatly impede the growth of the plant. It is even desirable to cut the first crop of alfalfa early before the weeds have had a chance to reseed. In fact, as full development cannot be expected until the third year, the principal aim in the meantime should be to eradicate the weeds. After a full growth is established no further cultivation is necessary.

For the best results the top soil should be light and not sandy and the soil of a clayey loam. It is desirable that the sub-soil also be of a clayey nature, as this will retain the moisture needed by the plants in the drier seasons. The thorough surface drainage necessary is afforded by its cultivation on slopes; but for the flat ground above or below the slopes it is necessary that depressions be filled up, as the plant will not thrive in marshy ground. A gumbo element in the soil if properly cultivated is not objectionable. Farm manure should be worked into such soil to lighten it and render it permeable to air and water.

It is usually thought that inoculating soil is necessary for the cultivation of alfalfa. Doubtless such addition is an advantage and its use is recommended where it can be conveniently obtained either from soils in which the plant has been grown or commercially. However, good results have been obtained without any inoculation.

This plant is a prolific seed producer and no expense is necessary for further seeding. It is a favorite food for all sorts of stock and it is seldom difficult to command the services of adjoining farmers to harvest the slopes for the hay obtained. As many as six cuttings might be made in a season. The plant has been successfully cultivated for a roadway protection upon the slopes of embankments throughout the low lying lands of the Atlantic sea coast.

OCCASIONAL GRASSES AND SEDGES

There are other plants which have been found useful for holding embankments but which are of somewhat less common application. Bermuda grass ranks high as one of the turf forming grasses. It is extensively cultivated in the southern states but is generally distributed over the warmer portion of the United States. It does not thrive in the more northerly districts, which are subject to long continued periods of dry weather, except where the means is available for plentiful watering. This grass spreads freely by creeping root stocks. Like the grasses in general it requires good drainage. Where appearance is an important consideration, June grass should be mixed with it. These supplement each other in different kinds of weather and assure a green bank during every part of the growing season. The other grasses that have good binding qualities are quack grass, Rhode Island Bent and red top.

Irish Heath is one of the sedges that has been used with greater or less success for holding the slopes of cuts. It is an evergreen plant and bears a small purple or white flower. It is propagated by seeds or cuttings and thrives best in peaty, sandy soils. Protection must be afforded the plant during the winter in the northern parts of the United States. Slopes along the Pennsylvania have had the protection of this plant for periods of 15 years, and while the growth is quite satisfactory when established, its development is somewhat tedious.

ENGLISH RAILWAYS COMPELLED TO CURTAIL PASSENGER SERVICE.—It has been officially stated by the English Railway executive committee that in order to keep the lines as free as possible for military and naval traffic, it has been found necessary still further to curtail the service of passenger trains and facilities in certain particulars, which will be duly notified to the public.

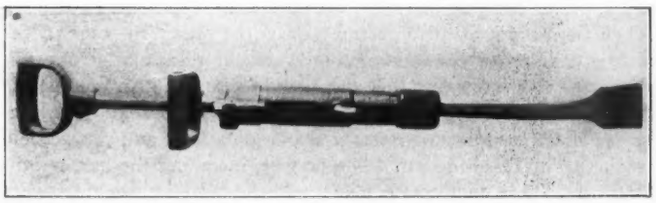
A PNEUMATIC TIE TAMPER

The New York Central & Hudson River used 12 portable compressed air plants during the past season for the operation of pneumatic tie tampers. Experiments have been made on this road with pneumatic tools for this purpose for several years and the experience gained in these trials showed the necessity for a number of changes in the design of the early types of such tools to secure the best tamping results and to make them easy to operate.

The Compressor Car with Machinery Enclosed Ready for Operation as an Ordinary Motor Car

The principal advantage claimed for this system of tamping is the greater speed with which the work can be done. It has been stated by supervisors who have tried these machines that two men with a machine can tamp 350 to 450 ft. of track per day, or about as much as 10 men using ordinary tamping bars. One unit, consisting of a compressor and two machines, was worked continuously through one season and a careful record was kept of its performance and cost of operation. This record showed that two men could tamp 300 ties per day and the cost of tamping was $0.026 per tie as compared with a cost of from $0.10 to $0.20 per tie by hand tamping.

In addition to this, the rapid vibration of the tool serves to compact the ballast under the ties more uniformly than is ordinarily possible by hand tamping and the pneumatic tamper can be used around frogs, switches and crossings in limited space where it is extremely difficult to work a tamping bar. An indication of the increased stability of the track resulting from pneumatic tamping is furnished by tests conducted on the West Shore. Two adjacent sections, each 800 ft. long, located on the Hackensack Meadows where the foundation is soft and it is difficult to maintain the track, were selected for the tests, one section being tamped by hand and the adjacent section by the pneumatic machine. This track was not retamped for six months, during which time it was subjected to very heavy traffic. Provision was made to measure accurately the amount of settlement from fixed stone monuments, which showed at the end of the test that the maximum settlement in the hand-tamped track was 0.116 ft., and in the machine-tamped track 0.063 ft. The minimum settlement on the first section was 0.018 ft., and on the second, 0.004 ft. The average settlements were 0.067 ft. and 0.033 ft., respectively, showing that the machine-tamped track settled about half as much as the section tamped by hand. It is stated that the machine is equally effective in gravel, cinder, crushed stone or other ballast.

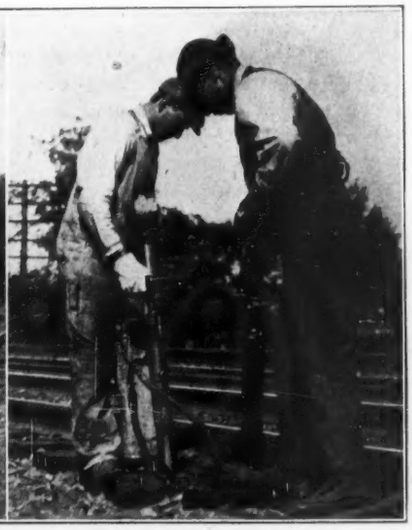


One of the Tamping Machines Fitted with the Proper Bar

The compressed air is furnished by an Imperial type, X-11, Ingersoll-Rand air compressor direct-connected to a 12-h.p. gasolene engine. The compressor and engine with the fuel tank, radiator, air receiver, tool box and automatic discharge unloader, are mounted on an ordinary 5 ft. by 8 ft. flat car fitted also with cross trucks having double-flanged wheels to allow the car to be removed easily and quickly from or placed on the track by four men. The car is self-propelled, being geared for a speed of 12 to 15 miles per hour and will carry 12 men. The compressor plant is completely housed in, although the sides of the housing may be removed when it is set out along the track for the operation of the tampers.

When the car reaches the work each side is raised in turn two or three inches to allow 2 in. by 4 in. scantlings to be slipped under the derailing wheels and on these the car is rolled to the outside of the main track. A simple rest suitable for supporting the car on steep embankments has been made by placing four old crossties vertically on the slope with their tops about level with

The Compressor Plant Supported at the Side of the Track Showing the Tampers in the Background



Two Men Operating the Pneumatic Tampers

the rails. These tie rests have been placed about 500 ft. apart, and, while very convenient, they are not absolutely necessary as a crib of ties will answer the purpose equally well. Where the fill is not great blocking will serve the purpose. As the car weighs only about 1,740 lb. fully equipped, four men can easily shift it in 45 minutes.

When the car is in position at the side of the track, the compressor plant is started and the ¾-in. supply hose connecting with the tampers is carried out along the tracks as needed. Supply hose in lengths up to 600 ft. has been used with satisfactory results. The compressor has a piston displacement of 49 cu. ft. at 80 lb. pressure, which is sufficient to operate two tampers continuously. Ordinarily two tampers are worked together on opposite sides of the tie in the manner usually followed with tamping bars. The tamping machine is fitted with two handles and its operation is not at all objectionable to the men. In some of the earlier models of pneumatic tamping machines a long stroke was imparted to the bar, but this was found to jar the man holding the machine so severely that it was quite uncomfortable. The machine illustrated herewith has a stroke of 1½ in. and can be held without any resulting jar. The tamper, including the bar, weighs 37½ lb. These compressor plants and the tamping machines were furnished by the Ingersoll-Rand Company, New York.

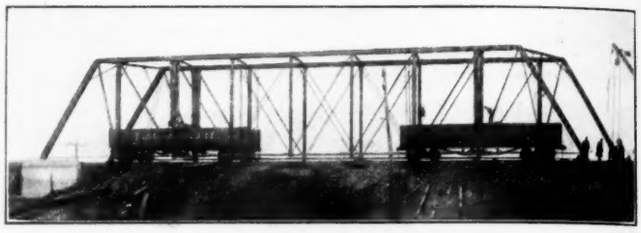
REMOVING THROUGH TRUSSES WITHOUT DISMANTLING

In renewing a four-span bridge over the Grand river at Ionia, Mich., on one of the branch lines of the Pere Marquette a unique method of removing the trusses without dismantling was developed. The old bridge consisted of three 130-ft. and one 150-ft. single track through pin-connected, skew-ended Pratt trusses with suspended floor beams upon which rested 15-in. I-beam stringers. The bridge was built in 1881 by the Detroit Bridge & Iron Works on piers and abutments of local sandstone of good quality. All the masonry was in good condition but the superstructure had become too light for the present loading.

After considering several plans for replacing this structure it

Raising the First Truss Span on Cars, Showing the New Girder Spans in Place

was decided to raise the grade about 6 ft. and install eight deck plate girder spans designed for Cooper's E-50 loading on the old piers and abutments and four new concrete piers at the mid-points of each of the old spans. The new piers were built first, using a derrick car for handling material and a concrete mixing plant mounted on a car in front of the derrick. In this way the new piers were completed without placing any of the plant in the river. After the piers were finished, the old trusses were jacked up to the new grade line and at the same time the earth fills were made in the approaches. As the work was handled at a season when the river is subject to sudden rises it was very desirable to avoid the use of false work and in the endeavor to accomplish this as well as to save expense the plan adopted was developed. The girder spans were placed one at a time, the main tracks being occupied about two hours for each of these operations. The new span was supported between two gondola cars which were run on the old structure to the proper location, the floor system of the old bridge in that portion of the span to be occupied by the girders was dropped into the river, and the new span then lowered into place. After the girders were all placed, the truss spans were raised one at a time enough to clear the tracks and approaches, and supported in this position on two gondola cars as shown in the illustration. The 130-ft. trusses weighed 107,500 lb. each, and the 150-ft. truss, 138,900 lb. The two cars

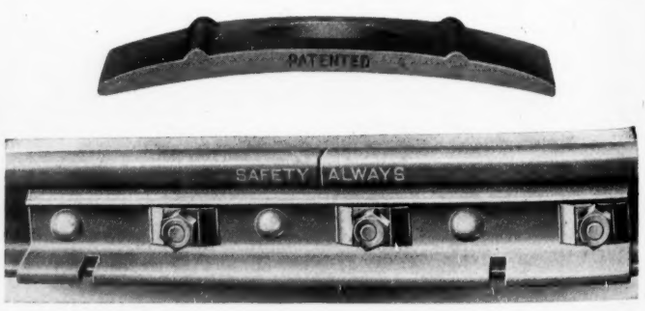


Lowering One of the Truss Spans from the Cars to Blocking Under the Panel Points

supporting the truss span were pulled to a point on the earth fill approach near one end of the structure where they were lowered onto blocking previously located to come under each panel point. With the trusses supported on this blocking the cars were removed and traffic could then be carried between them until they were dismantled. The track was occupied about four hours for the operation of supporting one of the spans on the cars, moving it and landing it on the blocking, the traffic being such as to permit this time to be arranged for. The dismantling of the trusses was handled quickly by a derrick car. The entire method worked out satisfactorily and proved to be very economical. This work was carried out under the direction of A. L. Grandy, chief engineer.

THE IMPROVED NEELY SPRING LOCK

The spring nut and bolt lock described in the *Railway Age Gazette* of August 21, has been radically changed in design, although it retains its distinctive features, which are the spring and the locking ribs. The new design shown in the accompanying illustrations is slipped over a bolt in the same manner as a washer, and as the nut is turned down it passes over the ribs until it is drawn tight, its final position being with the edges



The New Design of the Neely Spring Nut and Bolt Lock at the Top and Its Application to Track Bolts at the Bottom

of the nut parallel with the ribs. In this position the spring locking feature operates to prevent the nut from turning off or loosening under the impact of traffic, or as a result of the natural elongation of the bolt. This spring nut and bolt lock can be applied without special tools and can be used with either standard square or hexagonal nuts on standard track bolts. It is made from a high grade open hearth spring steel, each lock being heat treated, tempered in oil, and individually tested and inspected. This device is manufactured by the Neely Nut & Bolt Company, Pittsburgh, Pa.

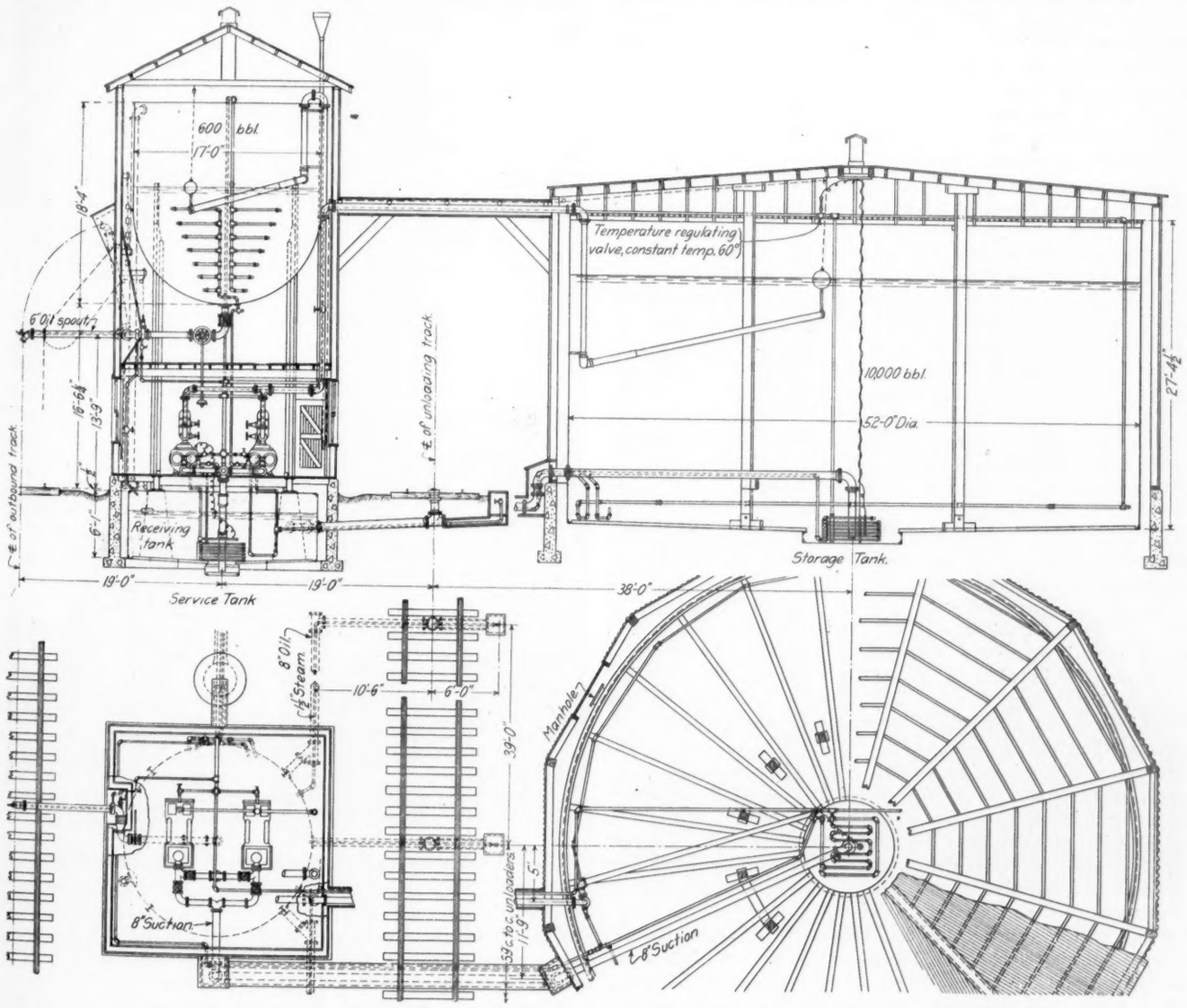
Fuel Oil Stations for Extreme Climatic Conditions

A Description of the Standard Layout Design for Six Divisional Points on the Grand Trunk Pacific

The Grand Trunk Pacific is planning to operate its line from Prince Rupert, B. C., east as far as Jasper, Alta., a distance of about 720 miles, with fuel oil, as soon as the necessary storage facilities are completed. This oil will be brought by boat from southern California to Prince Rupert, where large storage facilities will be provided by the oil company. The oil will be forwarded from this point to supply the interior fuel oil stations, which will be located at Pacific, Smithers, Endako, Prince George, McBride and Jasper.

While oil has been used for locomotive fuel on other western roads for a number of years, it has not been used under as extreme climatic conditions, the nearest approach being the Canadian Pacific lines, from 300 to 500 miles south. Along the line of the Grand Trunk Pacific the thermometer, which for weeks at a time stays in the neighborhood of zero, frequently descends to 40 below. On the other hand, California crude oil has the consistency of molasses and cannot run or be pumped unless it is at a temperature of 60 deg. F. This oil, to be delivered from the service tank to the locomotive must be heated to at least 100 deg. F. and not more than 110 deg., as a higher temperature will start evaporation of the volatile parts, thus reducing the efficiency of the oil as a fuel. From the above data it is evident that the proper heating of the oil is important.

The accompanying drawing shows the design which has been worked out to meet the above conditions. Each fuel station is located 400 ft. from the center of the roundhouse near the boiler room, from which the necessary steam for heating is obtained. The station is composed of two buildings, one, 20 ft. by 20 ft. by 35 ft. high, containing in the basement a receiving tank with a capacity of 240 bbl., on the ground floor a set of two pumps, indicators, etc., and on the upper floor a service tank with a capacity of 600 bbl. The other building of dodecagonal form, 56 ft. by 27 ft. high, contains the storage tank with a capacity of 10,000 bbl.



Plan and Elevation of Grand Trunk Pacific Fuel Oil Stations

The service tank delivers the oil on the outbound track and a storage track is located between the two buildings. The building of the service tank rests on a concrete foundation

forming the basement and is composed of a wooden structure, covered on the outside with corrugated galvanized iron, nailed to ship-lap and on the inside with ship-lap, hair insulator, nailing strips and ship-lap. The building containing the storage tank is a wooden frame structure resting on concrete foundations and covered with a roof made of five-ply roofing on ship-lap and the sides made of ship-lap, hair insulator, nailing strips, ship-lap and corrugated galvanized iron.

The receiving tank, which replaces the concrete sump generally used, will overcome the difficulty of heating and maintaining a concrete structure, which is almost impossible to keep water or oil tight, especially where the ground is soft, as it is at McBride and Smithers.

The receiving and storage tanks include a new feature in the design of their bottoms. Usually these large tanks have a bottom composed of rectangular plates with lap joints, which have to be assembled and riveted in the field. The assembling and riveting of such a large bottom is very difficult and has to be done on staging, which afterwards has to be removed while lowering the bottom to the ground. This is often the cause of deformation and rupture of rivets and plates and the disturbance of the foundation ground, which ought to be well leveled. It is not an unusual occurrence to have to raise the tank several times before water-tight joints are finally obtained. Besides these difficulties it is very hard to completely clean the bottom of the tank when necessary or to replace parts affected by rust or other causes of deterioration. To overcome all of these difficulties the bottom of the tank is divided into segments of such a size as can be readily furnished by the mills. These segments have small angles shop-riveted on them, the vertical legs of which are punched in order to connect the different segments together by riveting in the field. The whole bottom has a slight grade towards the center, which is made of a shallow tank one foot deep, shop-riveted and with the top angle turned inside; on this top angle the narrow ends of the segments are riveted. This arrangement allows the foundation, made of gravel and sand, to be well prepared and rolled to a true surface after the placing of the center part; then the different segments are placed side by side, temporarily bolted, and the riveting is done without disturbing the bottom. In case of accident the replacing of a part is easily accomplished by cutting the rivets in the vertical legs of the angles.

To operate these fuel oil stations one to three cars, placed on the storage track, are located so as to have their outlet pipes directly over cast iron catch basins, which carry the oil through 8 in. pipes direct to the receiving tanks. Steam pipes going through these pipes heat the oil running through the pipes and also the oil in the cars, by means of hose connecting the ends of the steam pipes to the heating systems in the cars. The oil in the receiving tank is heated, if necessary, by a set of steam coils placed in the center; the temperature being controlled automatically by a regulating valve, which will keep a constant temperature of 60 deg. F. This oil can be pumped direct to the service tank or to the storage tank through a 6 in. pipe, ended with an articulated galvanized iron spout to the extremity of which is attached a float keeping this extremity from 2 to 3 ft. below the surface of the oil. To the float is attached a cable which operates the indicators placed in the pump room. When no oil cars are available the oil is pumped directly from the storage tank to the service tank. The suction line is an 8 in. pipe leading from the floor of the storage tank directly underneath the tracks to the pumps. Both the inlet and outlet suction pipes, together with steam lines, passing between the two buildings are enclosed in wooden conduits. Each pump is of sufficient capacity to fill the service tank in two hours. Both pumps can be operated together in case of a rush or either pump may be shut off, allowing the other to work.

A system of steam coils, with a regulating valve, is placed in the storage tank, in order to keep the constant temperature of 60 deg. required around the suction pipe. A set of steam pipes with a regulating valve, giving a constant temperature of 100 to 110 deg. F., is also placed in the service tank. The oil from the service tank is delivered directly through a spout to the locomotive placed on the outbound track. This spout, when not in use, is raised and protected from the weather in a recess built in the side of the building. A Bowser self-registering pipe-line measure is located on the delivery pipe to indicate the amount of oil delivered to each engine.

The design of this station has been made by J. G. Legrand, bridge engineer. It was started under the general direction of B. B. Kelliher, former chief engineer, succeeded later by H. A. Woods, assistant chief engineer. The contract for these stations has been let to the Chicago Bridge & Iron Works, Chicago.

CONCRETE UNITS FOR CRIB CONSTRUCTION

By MacRae D. Campbell

Concrete units of various kinds have been made and used for crib construction for a number of years. Such units closely resemble ties and posts, even to the method of reinforcing. The type illustrated herewith, consists of an 8 in. by 8 in. concrete beam, reinforced against tension in the lower face, while light rods are placed in the top to protect against unusual strains in lifting and placing. The sections shown have so far been made in lengths varying from 4 to 8 ft. Two distinct types of members are used, one being used for the crib proper, and the other for the floor or front face of the wall where a true plane is desired. The units are held in place by steel pins which drop through holes in one unit and into others extending part way through the unit below.

The first use of this type of construction was in replacing

Condition of Wooden Bulkhead Replaced by the Concrete Crib Shown Below

wood cribbing holding the earth fill that carried the Pennsylvania tracks alongside of the historical block house at the corner of Liberty avenue and Water street, Pittsburgh, as shown in an accompanying illustration. Here the tracks are about 15 ft. above the elevation of the block house floor; and previous to placing the concrete cribbing, wooden construction shown had been used for 15 years, when its condition became such that replacement was necessary. The new crib, built of the concrete units, is 8 ft. wide at the bottom and 6 ft. wide at the top. The method of erection or assembling is shown by another view.

About the same time this construction was under way, a similar use was being made of this type of units on the Bessemer & Lake Erie, surrounding its storehouse and office building at Greenville, Pa. In this work a wall from 8 to 9 ft. high was

erected from header units extending back 6 ft. at the bottom and 4 ft. at the top. The Bessemer & Lake Erie construction represents a total of 880 ft. of face. Similar construction has been used by the State Highway Department of Pennsylvania, near Conemaugh, where the highway follows heavy fills, that were subjected to erosion from overflow wash during periods of high water before the concrete crib was used.

Concrete crib units suggest many possibilities. A unit, properly designed and constructed, represents a piece of enduring material. Present manufacturing practice involves the use of a rather wet mixture, such as would be best suited for concrete fence post manufacture, and placing forms on a vibrating table, so that the concrete may be made dense by agitating the mold, thus eliminating air and hence producing density and intimate contact of concrete with reinforcing metal. A 1:2:3 mixture is recommended. After the concrete has hardened sufficiently to

Placing the Concrete Crib Showing Method of Anchoring Units

permit removing the units from the forms, steam curing is used. This is the most approved method of curing concrete products, in that, if steam is properly admitted to the curing chamber by means of a pipe containing perforations on the lower side and placed in a trough filled with water, the steam released in the room will be saturated and the two elements most necessary to best cure the concrete, namely, heat and moisture, will be present at all times.

In building up the type of cribbing shown, the units are held together and in place by means of steel dowel pins, slipping through one unit and part way into a lower one, as already mentioned. The adaptability of this type of building material is shown by the fact that the construction may be permanent or temporary as desired. In the former case cement grout is poured around the dowel pins to give them protection against corrosion. In the latter case grout is omitted, so that if removal of the structure is contemplated within a relatively short time, the members may be taken down and used elsewhere.

Reinforcing metal of not less than ½-in. round steel rods should be placed in each of the four corners, not farther than 1 in. from the face. Certain requirements will call for metal of greater cross-sectional area. Concrete mixtures containing coarse aggregate not exceeding ¾ in. in maximum dimension are preferred. An advantage of placing equal reinforcement in all of the four corners is that workmen need not be watched to insure that a certain face always is placed down to attain effectiveness of reinforcement, which would be necessary if only the two corners in the intended lower face carried metal.

Modifications of the type of unit shown will suggest themselves in considerable number to interested engineers; for instance, a variation in the mortise-and-tenon feature of the filler units for the face of a wall. Forms can also be designed so that the ends of headers will interlock with stringers, thus doing away with some of the dowel pins.

Probably no greater field of usefulness exists for this construction than in the erection of temporary storage bins for coal, sand, gravel, and for temporary retaining walls or abutments where foundations are not the best; also for protection against water erosion along water fronts or embankments where such preventive construction is required. In the latter case these concrete cribs will furnish forms enclosing still water, in which concrete may be deposited to make a practically monolithic wall.

NEW BESSEMER & LAKE ERIE BLACKSMITH SHOP

The Bessemer & Lake Erie completed a new blacksmith shop last summer at Greenville, Pa., which embodies a number of improvements, the most notable being in the ventilation system provided. The building is of steel frame construction with brick walls, and is 120 ft. by 128 ft. 6 in. in plan and 28 ft. high to the lowest point of the roof.

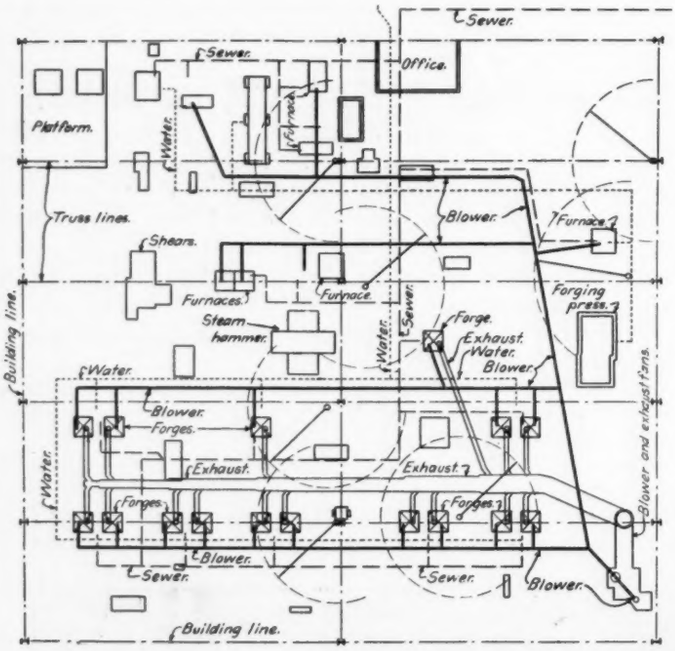
On account of the swampy nature of the ground the column pedestals and the walls were supported on 88 piles 32 to 38 ft. long, cut off at an elevation 1 ft. above the bottom of the foundation. A single string of 60-lb. rails was laid on the top of the wall-bearing piles except under the columns, where short rails were laid at right angles to the center line of the foundation. The walls are of common red shale building brick, and are 13 in. thick with 17-in. pilasters. The 168,000 bricks used in the building were laid in cement mortar made of clean river sand, Uni-

One of the Down Draft Forges in the New B. & L. E. Blacksmtih Shop

versal Portland cement and just enough lime to make it work smoothly. The windows in the sides and ends of the building are made up of nine sash, each of 16 lights, 12 in. by 14 in. The lighting surface in the walls amounts to 3,211 sq. ft., or 23 per cent of the wall surface, and in addition to this there are two monitors with 38 sash each of 9 lights, 12 in. by 14 in., a total of 798 sq. ft., or a grand total of 4,009 sq. ft. of glass. All lintels and sills are of reinforced concrete made on the ground and placed when the brick was laid.

The roof is supported by Pratt trusses, 128 ft. 6 in. long, with supporting columns under their center points. These trusses are

of extra heavy construction, as they were designed to carry one vertical concentrated load of 10,000 lb. applied at any point on the lower chord of any truss, and one horizontal concentrated load of 12,000 lb. acting in any direction applied at panel points on the lower chord of any truss. This provision was made to take



Arrangement of Pipe Lines Under the Floor of B. & L. E. Blacksmith Shop

care of swinging cranes. The lower chord is 21 ft. above the floor level, which is at the top of the foundation. The trusses are 7 ft. deep at the end and 15 ft. deep in the middle, giving the roof a slope of 1½ in. to the foot. The roof is of four-ply War-

Portion of the Interior of B. & L. E. Blacksmith Shop Showing the Clear Atmosphere

ren-Ehret built-up type, laid on 2-in. yellow pine sheathing. The inside surfaces of the walls were painted white with three coats of a special paint manufactured by the Illinois Steel Company and the underside of the roof was given two coats of white lead paint. All steel work in the trusses was painted black.

Special attention was given to means for keeping the atmosphere in the shop clear of gases by the installation of down-draft forges and the provision of ample ventilation. The accompanying photographs taken under normal operating conditions show how completely the smoke is collected from the 16 forges in the shop. The smoke and sulphur fumes from each forge pass up into a hood, then down through a suction pipe into a fan and up through the stack. The exhaust fan not only draws the smoke and fumes into the hood, but also additional air from around the forge which is naturally replaced by air coming in through the doors and windows, resulting in a constant supply of fresh air. The operation of the shop has shown that the atmospheric conditions are better than are obtained in the other shop buildings, contrary to the condition that ordinarily exists.

The blower, suction, sewer, water and gas lines are located under the floor, as shown in the accompanying drawing. The blower lines are of vitrified sewer tile with standard joints. Special care was taken to have all joints water tight under a pressure of 10 lb. per sq. in. These joints were made by carefully seating the spigot and then packing tightly around it a strand of oakum of a size not to exceed one-fourth the available space in the bell, which had been dipped in a neat cement grout.

Bessemer & Lake Erie Blacksmith Shop, Greenville, Pa.

The remainder of the bell was then filled with stiff cement mortar neatly beveled. The tile in these blower lines is from 4 in. to 15 in. in diameter. The completed line was tested by erecting a 6-in. pipe in a manhole and filling it with water to a height of 23 ft. The exhaust line, which is connected to the down-draft forges, is also a vitrified sewer pipe laid with the same joint as described above, but tested under a water pressure of 3 lb. per sq. in. This line is from 8 in. to 36 in. in diameter. The sewer line, which is arranged to drain all machine locations, varies in diameter from 4 in. to 10 in., and is also of vitrified tile. The water supply is brought in in a 3-in. main and distributed in pipes ranging down to ¾ in. in diameter. The gas for operating the furnaces is supplied in 3-in. lines.

This building was designed and built entirely by company forces under the supervision of the engineering department, H. T. Porter, chief engineer.

English Railwaymen with the Colors.—The question is now being frequently raised in England as to the percentage of railwaymen who have joined the colors. The Engineer has made a computation which leads to the belief that the percentage is 11.7. The Board of Trade returns showed that on December 31, 1913, there was a total of 643,135 employees on the railways of the United Kingdom. Of these, 49,047 were returned as boys and girls, but if it be assumed that all the engine cleaners, maintenance of way employees and others are over eighteen, and therefore eligible for enlistment, this figure is reduced by 7,284. Then among the 7,147 car cleaners there are some women. If 1,500 be allowed for these it makes the total number 600,000. As the number of men with the colors is now about 70,000, this makes the percentage 11.7, as above noted.

ECONOMY IN TRACK WORK AND ITS RELATION TO ROLLING STOCK

By J. W. POWERS
Supervisor of Track, New York Central, Oswego, N. Y.

Due to the continuance of business depression, retrenchments have been made by the railways to the lowest limit consistent with safety in many departments. When the danger line is reached no further reduction in expenses can be made. This is especially true in the maintenance of way department. Railway managers realize that it is not good policy or economy to reduce the wages of trackmen since reliable and safe men are required and these can only be secured through the payment of fair wages. After the number of men has been reduced as much as safety will permit, the limit of retrenchment in forces is reached. Yet if we study the questions of the proper maintenance of track and endeavor to eliminate factors which tend to increase its cost, there appear possibilities by which the amount of track work itself can be reduced.

A definite standard of track is no longer problematical, as it can be made largely what a company desires it to be. Despite this fact, on many roads the track and roadbed are not being improved commensurate with the demands made upon them by the increase in the train loads. There was a time when maximum loads were 40,000 lb., and 60 and 70 lb. rails were standard. Today we are handling cars of 120,000 lb. capacity over 80, 90 and 100 lb. rails, the wearing qualities of which are admitted to be inferior to the former 60 and 70 lb. rails, some of which are still in use under the heavier loads and increased speed of our modern trains. This inequality is now beginning to receive the consideration that its importance merits and as a result heavier and stiffer rails are being laid. The use of such rails means a saving in ties, less disturbance of the ballast, and a reduction in the expense for maintenance, while it greatly reduces the friction or resistance of trains. These are matters which have a most important relation to the economy of track work and the general operation of the road.

It is an acknowledged fact that to secure safe and efficient operation and maintenance, the track must be in the best possible condition. Failure to maintain accurate gage, correct line and true surface result in lateral and vertical movements of trains and create impacts which still further derange and distort the materials in the track.

It frequently happens that heavy engines and cars of increased capacity are operated over light rail until the expense of track repairs becomes so great that it is found absolutely necessary to lay heavier rail. This is then often laid without any special preparations being made to receive it, even on lines whose roadbed is in poor physical condition and as a result the new rail soon assumes many of the kinks found in the old rail, especially if the work of tie spacing and renewals, surfacing, lining and gaging does not follow immediately after the rail is laid. If this entire process were reversed it would prove more satisfactory in the end. The time to increase the weight of motive power and rolling stock is after the track is put in good condition. Ties should be spaced, decayed or defective ties renewed and the track put in good gage, surface and line, to increase the life of new rail, decrease the cost of future maintenance and insure safe and efficient operation.

It should be understood that merely cutting down expenditures is not necessarily economy and that it is often a wiser policy to make a large outlay at one time and thus reduce the cost of maintenance for several years in the future than to distribute the expenditures in small sums and have a continual high charge for maintenance. There are many types of track appliances now available that will effect a saving in track maintenance and meet the demand for better, more rigid and permanent track construction. Some of the devices referred to are tie plates, rail anchors, guard rail clamps, improved guard rails, manganese frogs, etc.

Everyone who has served his apprenticeship on the track or who has even had his attention called to the subject of track repairs, has been forcibly impressed with the large amount of work which is annually expended in gaging track and adzing ties to hold the rail perpendicular or in such a position that the wheels will cover the entire surface of the ball of the rail, thus increasing the area of contact and decreasing the tendency to disrupt the rail, as well as decreasing the pressure per square inch and endeavoring to place the load over the web to avoid eccentric loading. This will also increase the tractive power of a locomotive and prevent it from slipping and blistering rails, while also decreasing the rate of wear of wheels.

We know that with new rails of ordinary design placed on new sawed ties and with car and engine wheels having a coning of 1 in 20, the line of pressure is moved from the center of the rail toward the inner edge of the head, making it necessary to adze the new ties in order to bring this line of pressure back to the center. It is also known that the rail tends to turn out under traffic causing the outer rail flange to cut down into the fibre of the wood more quickly than the inner. Thus the rail is canted outward, widening the gage, increasing the lateral sway of the train and making it necessary to again adze ties beneath the rail and to regage the track. Some railways are reducing the coning of locomotive tires to 1 in 38 and if all wheels were reduced to at least this ratio it would eliminate, to a great extent, the necessity of adzing the ties in order to incline the rail when gaging track. A considerable diversity of opinion exists among men in the motive power and car departments regarding the advantages of tapered wheels, while nearly all track men give a decided preference to non-tapered wheels which minimize rail breakage, decrease the rate of wear on wheels and insure safety in service.

The tie plate is an accessory which requires a great deal of careful study. The best tie plate is one that will not buckle, that will imbed itself thoroughly in the tie, that has a shoulder to protect the spikes and that has a bearing surface greater on the outside than on the inside of the rail to prevent the rail from tipping. There are many essential features which a tie plate should have to support the rail properly under its various movements. These movements of the rail under different conditions must be thoroughly understood in order to construct and adjust tie plates so that they will properly perform the duties required of them. In deciding upon the kind of plates to be used, due consideration should be given to the efficiency of the various types of plates, the labor of inserting them and the cost of material.

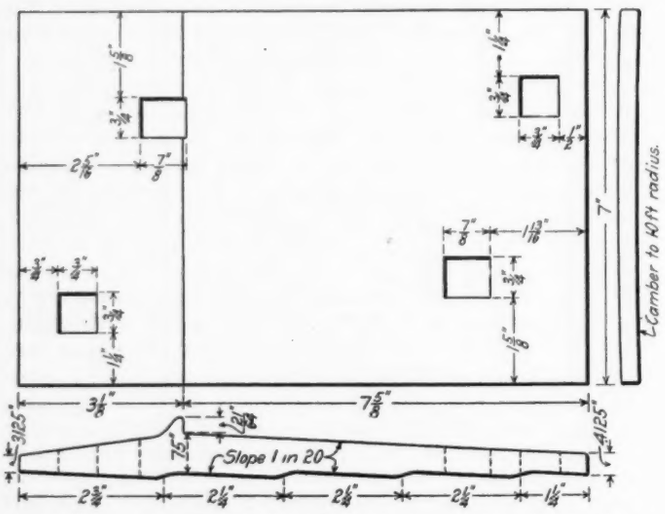
Those who have been observant have been forcibly impressed with the rapid destruction of frogs under heavy traffic despite the fact that vast improvement has been made during the past few years in the way of better and stronger construction and the use of manganese. The difficulty is that corresponding progress has not been made in the elimination of the destructive blows on frog wings and guard rails. If wheels are so mounted that they can deliver blows on frog and guard rails after they have been properly placed, the maintenance of way department will continue to suffer the effects.

It is practically impossible to adopt and maintain dimensions for the track and wheels that will entirely prevent blows to guard rails and frogs, but it is possible to adopt dimensions that will eliminate the impingements on the frog points and minimize the destructive effects of blows on the frog wings and guard rails. When we consider that every railroad has in its main tracks many frogs and guard rails over which high speed trains run and that under ordinary conditions many wheels of such trains are liable to strike

heavy blows on both the frogs and guard rails, the importance to the mechanical and maintenance of way departments is seen of the correct mounting of car wheels on their axles and their maintenance at proper gage, demonstrating the necessity for mutual discussion between departments.

EFFECT OF LUNDIE TIE PLATES ON RAIL WEAR

A recent inspection of test rails in the main track of a trunk line railroad near New York indicated clearly the effect in decreasing rail wear which is secured by the Lundie tie plate. New 100-lb. A. R. A. type A rails were laid on parallel tracks on a 5-deg., 40-min. curve carrying a heavy freight traffic one year before the inspection referred to. The Lundie tie plates were placed under the rails in one track while ordinary flat plates were used in the other track. The superelevation of the high



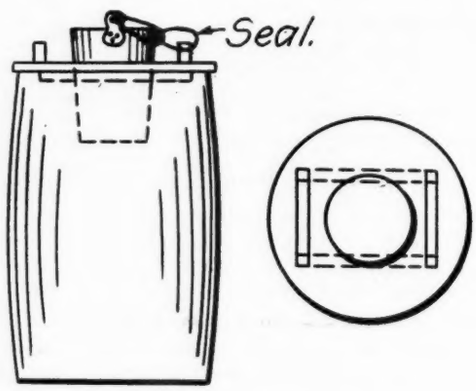
Details of a Lundie Tie Plate as Used on a Large Eastern Road

rail was standard. The usual wear of the rail head was found on the track laid with flat plates as indicated in the accompanying drawing reproduced from measurements made of the rail head at the time of inspection, while the rails laid on the canted plates show a slight wear uniform over the surface of the head. These plates are also in use in about 20 other installations in which it is said that similar results are being secured.

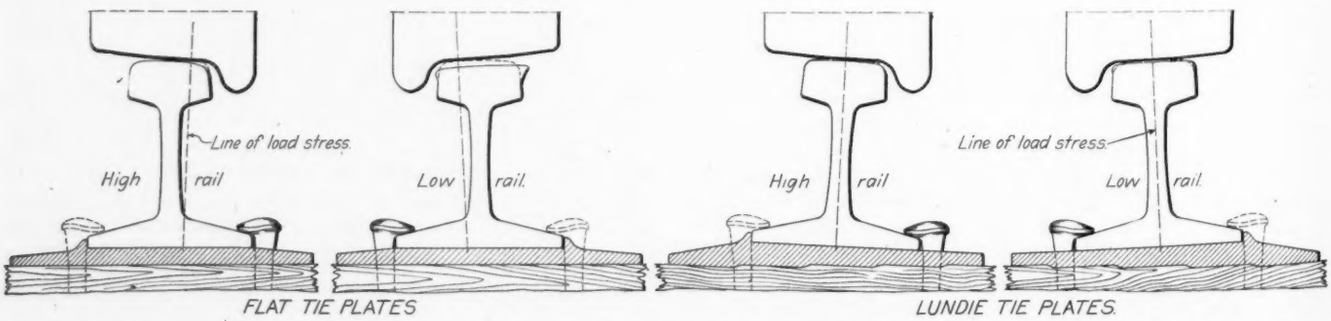
This tie plate is designed to support the rail at an angle of 1 in 20 with the horizontal, equivalent to the angle of coning on car wheels so that the surface of contact between the wheel and the rail and the rail and the tie plate will be perpendicular to the direction of application of the wheel load. In addition, the underside of the plate is given a bearing on the tie, a large part of which is perpendicular to this stress by a series of stepped surfaces, each of which has an angle of 1 in 20 with the horizontal. The advantages claimed for this method of support in addition to the reduction in wear on the rail head are: a decreased tendency of the rails to spread, a lessening of the internal stresses in the rail due to loading the head centrally and a reduction in wear on car wheels equivalent to that on the rail head. The plate is cambered on a 10-ft. radius parallel with the axis of the rail so that it does not present a sharp edge under the base of the rail when the wheel load passes over it. It is claimed that this feature gives the added advantages of an easy riding track in that the rail adjusts its bearing on the plate and an absence of rattling owing to the fact that the plate does not tilt under approaching or receding loads. The plate is said to perform its functions equally well on hard and soft ties, as on a hard surface which does not compact readily, the camber will allow complete resilience under load, the flattening of the plate producing stresses within the elastic limit of the metal. The accompanying drawing shows the details of one of these plates as applied on an important eastern road. The plates are patented by John Lundie, 52 Broadway, New York City.

COVER FOR A WATER BARREL

The accompanying sketch shows a cover for a water barrel used for fire protection about stations, company buildings and bridges, which has been employed on the Coast division of the Southern Pacific for the past six or eight months, with very satisfactory results. As shown in the sketch, this consists simply of an ordinary cover over the barrel, with an opening in the center in which the bucket is placed. In this position the bucket does not become water-soaked to the extent that it does if submerged in the barrel, while on the other hand its partial submersion prevents it from drying out from exposure to the weather. The handle of the bucket is fastened to the cover by an ordinary car seal, preventing its removal by maliciously inclined persons without some inconvenience.



Special Cover for a Water Barrel



Cross Sections of Rails in Adjacent Tracks After One Year's Service on Flat and Lundie Tie Plates, Respectively, Showing Difference in Wear on the Heads

General News Department

On March 4 the roundhouse of the Cleveland, Cincinnati, Chicago & St. Louis at Benton Harbor, Mich., was destroyed by fire.

The legislature of Indiana, which adjourned March 8, passed a law providing for workmen's compensation, to be administered by a state commission.

The Panama Railroad has bought for $150,000 one of the piers of the Pacific Mail Steamship Company at Colon. This leaves but one pier at Colon which is not under the direct control of the United States government.

John G. Cooper, of Youngstown, Ohio, until lately a locomotive engineer on the lines of the Pennsylvania company, is now the representative in Congress from the Nineteenth Ohio district. He has served two terms in the Ohio legislature. He has been a prominent worker in the anti-liquor campaign.

A resolution has been introduced in the legislature of California asking the federal government to buy and operate the Western Pacific Railroad, which is in the hands of a receiver. The resolution declares that the road, unless bought by the government, will become allied with other roads and competition will be destroyed.

The committee of the United States Senate which has been investigating charges that the Southern Railway, in dealing with coal traffic, has discriminated against Charleston, S. C., and other ports south of Norfolk, has apparently given up its quest; and the sub-committee in charge of the inquiry has referred it to the Interstate Commerce Commission.

E. J. Chamberlin, president of the Grand Trunk Railway of Canada, in a statement printed in the Montreal Gazette, says that for forty years past the Grand Trunk has been carrying the mails for the Canadian government at what has been definitely established is approximately one-half the actual cost to the company for the service.

The "Safety First" committee of the Baltimore & Ohio reports that 91 per cent of all items recommended to improve safety conditions during 1914 were disposed of by the company. Recommendations totaling 9,256 items were made by 698 employees who are members of safety committees on 23 divisions. Only 806 of the items reported remain under consideration.

Many railway builders of western Canada, men who have carried out large contracts in the construction of new railways during the past few years, are going to devote their forces and equipment this season to breaking up land for agriculture, and to the cultivation of wheat. It is said that many of these men will carry out this work on tracts owned by themselves.

In the federal court at Philadelphia, March 10, indictments were returned by the grand jury charging the Pennsylvania Railroad with granting rebates on coal and coke shipped from Kittanning, Pa., to Trenton and Hoboken, N. J. The road is alleged to have allowed 10 cents a ton on shipments made from the Glen-White Coal and Lumber Company's mine at Kittanning between December 1, 1911, and July 18, 1912.

The Canadian Pacific has asked the Canadian Parliament to authorize the establishment of a separate corporation to take over the ocean steamships owned by the roads, the new concern to be known as the Canadian Pacific Ocean Services, Limited; and the railway committee of the lower House has approved the bill to carry out the company's purpose. The new corporation will be organized in England and the proposed amount of capital is $15,000,000.

Rule G, the well-known paragraph of the Standard Code of Train Rules prohibiting the use of intoxicating liquors, has been taken as the theme for a motion picture, based on Rufus Steele's story in the Saturday Evening Post. The film was staged in the yards and offices of the Southern Pacific Company at San Francisco, and the road placed all its facilities at the disposal of the camera men. Even the actors were selected from the ranks of the company's employees. This film is to be shown in numerous places along the Southern Pacific lines, and elsewhere

After a thorough investigation of the results of the fire which occurred at the Thomas A. Edison, Inc., plant at West Orange, N. J., several weeks ago, the company's engineers and a special committee appointed by the American Concrete Institute, report that 87 per cent of the reinforced concrete buildings, which were subjected to a very intense heat, are in good condition and about 85 per cent of the machinery which they contained can be used after making minor repairs. Buildings made of other material were entirely destroyed. The committee commented on the advantages of monolithic structures.

C. W. P. Ramsey, of Montreal, engineer of construction on the Canadian Pacific, is to be the commander of the company of engineers which is to be recruited along the lines of the Canadian Pacific for service at the seat of war in Europe. Mr. Ramsey not only has had long experience in railway construction, and also in other departments of the Canadian Pacific, but is also a soldier, having served as lieutenant in the militia of Canada. This corps of engineers is to be made of two companies of 250 each, and all must have had railway experience. Recruiting will be begun at once, and will not be confined to employees of the Canadian Pacific. About 400 applications have already been received. Mr. Ramsey will have the title of lieutenant colonel, and there will be two majors.

The Supreme Court of the United States on March 4 issued an order restraining the New York State Public Service Commission, First district, from enforcing the alien labor law of New York pending a final adjudication of all the litigation by the Supreme Court. This has the effect of neutralizing the recent action of a New York state court in sustaining the law which forbade the employment of aliens on public work, and caused the dismissal of several hundred men by the contractors engaged on the subways in New York City. Four days after the action at Washington the legislature at Albany repealed the mandatory clause of the law in question; so now the alien can be taken back. The contractors say that most of the American citizens who have been employed temporarily have proved very inefficient. In the underground operations the men who have been long engaged in the work have come to possess a peculiar fitness, which the new men could not or would not acquire.

Cornell Men at the Engineering Convention

All Cornell men expecting to attend the annual banquet of the American Railway Engineering Association, to be held on Wednesday, March 17, who desire reservations at the Cornell table, are requested to advise H. G. Holloway, 647 Railway Exchange building, Chicago, not later than Monday, March 15.

Demurrage on One Car in 900

E. E. Mote, manager of the Pacific Car Demurrage Bureau, San Francisco, reports that in San Francisco and Los Angeles the carload freight handled by the principal draying concerns is rarely held in excess of the free time; and, searching for the causes of such good service he found that 15 of these concerns unloading in one year 14,332 cars paid but $48 demurrage. The California demurrage rate is $3 a day. Assuming that each charge at that sum represents a different car and a single day's delay in excess of the free time allowance, he finds that approximately, only eleven one-hundredths of 1 per cent of the cars were held overtime and that the entire overtime was 16 days; no allowance being asked for or made on account of inclement weather, although the rainfall was twice as much as in normal years. Practically all these cars were unloaded on the public delivery tracks, and the freight was hauled from the cars. This.

says Mr. Mote, shows that with active and systematic conduct of work by concerns properly equipped there is no real necessity for holding a single car long enough to incur demurrage.

Brooklyn Marginal Railroad

The New York legislature has passed an act to authorize the city of New York and a number of the principal railroads terminating on the shores of New York harbor to co-operate in the operation of a freight railroad on the waterfront of Brooklyn—along parts of the East river and the bay—and to make important improvements, and it is expected that this action will be followed by the construction of extensive additions to the present track facilities, owned by the city, on the docks in the region mentioned.

The law amends the New York City freight terminals act, so as to permit trunk line railroads to hold the stocks and securities of a terminal company, formed under the supervision of the city board of estimate; and, under contract with the city, for the operation of terminal facilities along the waterfront from South Brooklyn along the East river to Newtown creek in Queens Borough.

Valuation Inventories Called For

The Interstate Commerce Commission has issued valuation order No. 13, calling for inventories of railway property. It provides, in substance as follows: That every common carrier owning or operating a steam railroad whose property is to be valued by the commission under the valuation act of March 1, 1913, and every receiver or operating trustee of any such carrier, shall prepare and file with the commission a complete inventory of the quantities, units, and classes or kinds of property in its roadway and track; bridges, buildings and all other structures; signals and interlockers; telegraph and telephone lines; electrical apparatus; and any and all fixed property except lands and equipment included in valuation orders Nos. 7 and 8. Such inventory shall be filed upon such dates, in such detail, upon such forms, and for such part or parts of the property described below as the director of valuation shall require, provided that he shall allow in all cases a reasonable time for the preparation of such inventory, which shall in no case be less than 30 days: That the inventories herein required shall be made separately for the following accounts as described by the Interstate Commerce Commission in its classification of investment in road and equipment of steam roads effective on July 1, 1914:

3. Grading.
4. Underground power tubes.
5. Tunnels and subways.
6. Bridges, trestles, and culverts.
7. Elevated structures.
8. Ties.
9. Rails.
10. Other track material.
11. Ballast.
13. Right-of-way fences.
14. Snow and sand fences and snow-sheds.
15. Crossings and signs.
16. Station and office buildings.
17. Roadway buildings.
18. Water stations.
19. Fuel stations.
20. Shops and engine houses.
21. Grain elevators.
22. Storage warehouses.
23. Wharves and docks.
24. Coal and ore wharves.
25. Gas producing plants.
26. Telegraph and telephone lines.
27. Signals and interlockers.
28. Power dams, canals, and pipe lines.
29. Power plant buildings.
30. Power substation buildings.
31. Power transmission systems.
32. Power distribution systems.
33. Power line poles and fixtures.
34. Underground conduits.
35. Miscellaneous structures.
36. Paving.
38. Roadway and small tools.
39. Assessments for public improvements.
43. Other expenditures—Road.
47. Unapplied construction material and supplies.

Agreed Valuations of Freight Illegal

The bill to make common carriers liable for lost or damaged freight to its full value, regardless of any agreement limiting the amount recoverable, which was noticed last week, page 415, and which was signed by the President March 4, has been published, as Public Law No. 325. It takes the form of an amendment to section 7 of the Interstate Commerce law.

The first change is to make this section apply to all interstate commerce, all commerce in territories and all going to adjacent foreign countries. The liability of the carrier for damages clear through to destination, applies through to a destination in an adjacent foreign country. Any contract, rule or regulation limiting liability for losses is made invalid without respect to the manner or form in which it is sought to be made; but in the case of goods which the carrier cannot see and know the character of, he may require the shipper to state the value in writing; and the Interstate Commerce Commission may establish freight rates dependent on the value of the property as thus stated. Carriers are forbidden to limit to less than ninety days the period for giving notice of a claim; or less than four months for filing claims; or less than two years for the institution of suit; and if the loss or damage occurs while the freight is being loaded or unloaded, or is due to carelessness or negligence, no notice of claim nor filing of claim shall be required as a condition precedent to recovery. The act takes effect June 4, 1915.

C. P. R. Welfare Agent

T. G. Shaughnessy, president of the Canadian Pacific, has issued the following circular:

"In view of the benefits derived from certain voluntary agencies, such as the St. John Ambulance Association, the Safety First movement, the Railroad Y. M. C. A., and Athletic Associations, I have decided to appoint an officer to co-operate in the development of such organizations amongst the employees of the Canadian Pacific Railway, with the title of general welfare agent. Lieut.-Colonel Lacey R. Johnson, heretofore general superintendent of Angus shops district, who since he joined the service in 1882 has been actively identified with the general uplift of ideals and service among the railroad employees, will assume that office."

Check on Excessive Efficiency

Congress, in making appropriations for the support of the army for the next fiscal year, has inserted in the law a proviso that no part of the appropriations made at this time shall be available "for the salary or pay of any officer, manager, superintendent, foreman or other person having charge of the work of any employee of the United States government while making or causing to be made, with a stop watch or other time-measuring device, a time study of any job of any such employee between the starting and completion thereof, or of the movements of any such employee while engaged upon such work; nor shall any part of the appropriations made in this bill be available to pay any premium or bonus or cash reward to any employee in addition to his regular wages, except for suggestions resulting in improvements or economy in the operation of any government plant; and no claim for services performed by any person while violating this proviso shall be allowed."

Proposed Railway Legislation

A bill before the legislature of Connecticut proposes to tax railways on the basis of their gross earnings instead of on the valuation of stock, as at present.

A bill to provide for the incorporation of trackless trolley companies has been introduced into the Pennsylvania legislature. It would enable them to incorporate and to be governed by the same regulations as apply to automobiles and trucks.

The lower House of the Indiana legislature has defeated the bill to give the public service commission power to authorize an increase in passenger fares from 2 to 2½ cents a mile.

The House of the Missouri legislature last week passed a bill authorizing the state public service commission to advance passenger fares to 2½ cents a mile if the commission after a thorough investigation finds the increase necessary.

Officers of the principal railroads in Nebraska held a conference on March 3 with the governor and a committee of the legislature at Lincoln to urge support for the proposed increase in state passenger fares from 2 to 2½ cents a mile. Among those who addressed the governor and the committee were W. A. Gardner, president of the Chicago & North Western; Hale Holden, president of the Chicago, Burlington & Quincy; A. L. Mohler, president of the Union Pacific; E. J. Pearson, vice-president of the Missouri Pacific, and L. M. Allen, passenger traffic manager of the Chicago, Rock Island & Pacific. After presenting their arguments to the Nebraska committee these railroad men and others addressed the Des Moines (Iowa) Chamber of Commerce on the subject of passenger fares; and the chamber adopted resolutions favoring the adoption by the legislature of some plan that would give the railroads an opportunity to be

heard before a body or commission with authority to take such action as the facts may warrant.

TEXAS.

A prominent railway officer of Texas writes to the *Railway Age Gazette* as follows:

"The Texas legislature was a pioneer in passing drastic bills against the interests of railroads, but there has been a change. In the 33rd session, sitting two years ago, they began to carefully consider all restrictive measures, and the present session (the 34th) has turned down every objectionable bill, except the bi-monthly pay-day act, which will become effective January 1, 1916. As the day of adjournment is not far off we believe now no bad measures will pass. At least two-thirds of the members have shown an appreciation of conditions, which is indicated by the vote of 69 to 35 against the hospital bill and another vote of 87 to 38 against a resolution in the House to investigate the railroad lobby working against this same hospital bill. The proponents of this resolution approved of a strong lobby, mostly not railroad employees, working for the bill, but denied the right of employees and officers to work against it.

"The so-called representatives of union labor introduced about every notion that has ever been invented by railroad baiters and the union labor lobby has been as aggressive and persistent as ever, demanding obedience by members on penalty of losing the labor vote, though one member discovered there were only fourteen labor union votes in his district.

"The Texas legislature must be credited with considerable conservatism. One member of the Senate in speaking against a bill to require certain employees, including agents, to have a lay-off of four days each month, served notice on organized labor that they were going beyond the bounds of reason and had become too aggressive and domineering; that they must remember that they represented less than 15 per cent of the working people of Texas."

Western Society of Engineers

The Western Society of Engineers, Chicago, is planning a special "Electrification" program for the meeting on Tuesday evening, March 16, the week of the convention of the American Railway Engineering Association. The subject under discussion will be "The Operating Results of the Electrification of Steam Railroads." Among the speakers will be W. S. Murray, consulting electrical engineer, New York, New Haven & Hartford, and E. B. Katte, chief engineer, electric traction, New York Central. The projects of the Pennsylvania, the Norfolk & Western, the St. Paul and the Butte, Anaconda & Pacific will also be described.

American Society of Civil Engineers

The constitutional convention for the state of New York is to convene on April 15, 1915. Matters of interest concerning the engineering profession are to come before that convention, at which the American Society of Civil Engineers is to be represented by Arthur S. Tuttle, Henry W. Hodge and Alfred D. Flinn. On Wednesday, March 17, 1915, at 8:30 p. m., at the house of the society at 220 West Fifty-seventh street, New York, the above representatives will lay before the engineering profession the result of their deliberations.

Annual Dinner A. R. E. A.

The annual dinner of the American Railway Engineering Association will be held at the Congress hotel, Chicago, on the evening of March 17. The speakers will include Charles S. Gleed, president, Missouri & Kansas Telephone Company; Sir George Foster, minister of trade and commerce, Dominion of Canada; Frank L. Mulholland, president of the International Association of Rotary Clubs, and Benjamin Baum, chief engineer maintenance of way, Maumee Valley Railroad.

American Society of Mechanical Engineers

The third seasonal meeting of the Chicago Section of the American Society of Mechanical Engineers will be held on Friday, March 19, at the hotel LaSalle, Chicago, dinner being served at 6:30. The subject of Refrigeration, with special reference to ice-making as a by-product of central stations will be considered at 8 o'clock. Heywood Cochrane of the Carbondale Machine Company, Chicago, will make an illustrated talk.

MEETINGS AND CONVENTIONS

The following list gives the names of secretaries, dates of next or regular meetings, and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Next convention, May 4-7, 1915, Hotel Sherman, Chicago.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Demurrage Commissioner, 845 Old South Bldg., Boston, Mass. Annual convention, March 23, 1915, Jefferson Hotel, Richmond, Va.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, Illinois Central, East St. Louis, Ill. Annual meeting, May 21-24, 1915, Richmond, Va.

AMERICAN ASSOCIATION OF PASSENGER TRAFFIC OFFICERS.—W. C. Hope, C. R. R. of N. J., 143 Liberty St., New York. Next meeting, April 15-16, San Francisco, Cal.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next session, May 19, 1915, Atlantic City, N. J.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Next convention, March 16-18, 1915, Chicago.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. W. Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except June, July and August, 220 W. 57th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—E. R. Woodson, 1300 Pennsylvania Ave., N. W., Washington, D. C. Annual convention, April 28, 1915, Piedmont Hotel, Atlanta, Ga.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. W. Egan, B. & O., Baltimore, Md. Annual meeting, May 19, 1915, Galveston, Tex.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawler Ave., Chicago. Regular meetings, 2d Monday in month, except July and August, Lytton, Bldg., Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual meeting, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month, Room 1856, Transportation Bldg., Chicago.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, C. & E. I., 922 McCormick Bldg., Chicago. Annual meeting, May 17-20, 1915, Hotel La Salle, Chicago.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Annual convention, May 26 to 28, 1915, Chicago, Ill.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Next convention, March 15-19, 1915, Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meetings, 2d Tuesday in month, except June, July, August and September, Boston.

NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meetings, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings monthly.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill. Regular meetings, 2d Thursday in month, Jefferson Hotel, Peoria.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Friday in month, Kansas City.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Monongahela House, Pittsburgh.

RAILROAD MASTER TINNERS, COPPERSMITHS AND PIPEFITTERS' ASSOCIATION.—U. G. Thompson, C. & E. I., Danville, Ill. Annual meeting, May, 1915.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Times Bldg., Bethlehem, Pa. Next meeting, March 15, 1915, Chicago. Annual meeting, September 21-24, 1915, Salt Lake City, Utah.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, L. S. & M. S., Box C, Collinwood, Ohio. Annual meeting, May 17-19, 1915, Hotel Sherman, Chicago.

RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

SALT LAKE TRANSPORTATION CLUB.—R. E. Rowland, Hotel Utah Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meeting with annual convention Railway Signal Association.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Candler Bldg., Atlanta.

TOLEDO TRANSPORTATION CLUB.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEWARK.—John J. Kautzmann, P. O. Box 238, Newark, N. J. Regular meetings, 1st Monday in month, except July and August, The Washington, Newark.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York. Regular meetings last Tuesday in month, except June, July and August, Waldorf-Astoria, New York.

WESTERN CANADA RAILWAY CLUB.—L. Kon, Immigration Agent, Grand Trunk Pacific, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Karpen Bldg., Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings.

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF JANUARY, 1915

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net operating revenue (or deficit).	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Alabama & Vicksburg	143	$74,682	$28,408	$114,205	$13,295	$27,514	$3,865	$47,354	$2,099	$6,488	$100,616	$13,589	$8,600	$4,989	—$12,780
Ann Arbor	294	132,844	36,164	179,927	13,067	20,062	4,624	84,343	242	7,843	130,181	49,746	10,580	39,155	21,329
Atlanta, Birmingham & Atlantic	639	158,072	34,508	210,553	34,742	45,060	11,450	102,443	163	11,036	204,894	5,659	13,100	—7,467	—28,578
Baltimore & Ohio Chicago Terminal	79	.....	443	117,270	6,206	13,828	731	57,992	1,201	5,706	85,665	31,605	19,021	12,584	28,221
Bangor & Aroostook	631	280,659	39,690	335,947	37,159	44,146	2,407	105,512	3	9,682	198,908	137,039	12,525	124,514	39,685
Bessemer & Lake Erie	205	191,542	23,409	224,664	37,627	144,488	12,870	122,353	.....	11,881	324,699	—100,035	17,011	—117,049	3,567
Birmingham Southern	44	36,340	551	64,766	8,152	11,166	654	26,145	.....	3,400	49,517	15,248	2,153	13,095	2,101
Buffalo & Susquehanna R. R. Corp	253	103,240	5,988	112,417	17,912	39,114	2,178	36,440	.....	4,828	100,472	11,944	2,600	9,344	—22,337
Buffalo, Rochester & Pittsburgh	586	571,694	78,418	672,294	68,314	155,786	16,882	260,398	1,288	20,938	523,604	148,690	20,000	128,680	—56,736
Central of Georgia	1,924	666,206	227,598	1,003,030	112,816	185,844	32,254	367,234	1,484	34,734	733,483	269,547	50,552	218,247	172
Central New England	304	289,108	33,434	339,302	26,080	29,537	1,520	105,337	.....	4,550	167,019	172,283	12,001	160,281	123,051
Chesapeake & Ohio Lines	2,368	2,574,198	373,654	3,121,868	314,702	624,947	51,650	1,124,315	16,430	71,763	2,203,807	918,061	115,009	802,627	—65,922
Chicago & North Western	8,108	4,208,112	1,473,894	6,317,467	557,090	1,030,756	104,949	2,618,443	47,174	148,820	4,501,622	1,815,845	375,000	1,440,442	112,164
Chicago Great Western	1,429	811,620	234,150	1,142,831	94,722	211,261	43,403	477,727	7,378	35,644	869,528	273,302	48,668	223,593	—5,509
Chicago, Peoria & St. Louis	255	102,615	18,977	129,972	18,906	27,210	6,025	59,468	.....	5,349	116,957	13,015	5,700	7,315	20,868
Chicago, St. Paul, Minneapolis & Omaha	1,753	971,712	352,568	1,423,045	97,099	196,322	29,568	651,189	12,994	38,018	1,024,997	398,048	83,157	314,117	—122,650
Cincinnati Hamilton & Dayton	1,015	486,057	103,800	672,516	127,706	193,368	19,445	351,245	20,715	23,257	735,388	—62,873	34,525	—97,458	—15,094
Cincinnati Northern	246	89,670	14,468	108,271	20,879	30,754	2,520	42,899	.....	4,032	101,085	7,186	5,500	1,685	32,293
Cleveland, Cincinnati, Chic. & St. Louis	2,381	1,937,421	629,437	2,802,568	295,574	644,938	72,431	1,222,621	23,988	65,894	2,319,516	483,052	128,000	354,689	523,585
Colorado Midland	338	99,215	9,982	122,640	14,096	26,895	7,126	52,006	796	5,650	106,569	16,071	8,530	7,541	7,563
Cumberland Valley	164	151,684	50,044	214,139	19,090	30,914	4,289	81,794	1,204	7,636	144,926	69,212	5,794	63,418	—4,023
Delaware, Lackawanna & Western	960	2,077,096	596,505	3,030,952	258,745	565,430	69,367	1,168,676	26,027	82,356	2,110,415	920,537	186,600	733,868	18,542
Elgin, Joliet & Eastern	776	526,599	3	558,721	58,401	116,735	6,306	196,225	.....	17,230	394,895	163,826	40,890	122,936	—42,748
Florence & Cripple Creek	87	82,614	12,822	97,490	9,867	9,656	2,311	27,348	.....	3,414	52,596	44,894	4,787	40,108	2,263
Florida East Coast	745	213,817	213,621	512,507	63,999	62,740	17,590	162,199	3,506	14,885	323,590	188,917	18,000	170,154	17,932
Illinois Central	4,769	3,878,752	1,015,396	5,279,315	519,162	1,099,264	106,622	2,021,592	30,332	130,307	3,879,558	1,399,757	269,000	1,129,046	102,704
Indiana Harbor Belt	110	.....	.....	248,249	29,995	23,294	2,795	129,589	.....	7,653	193,325	54,923	6,950	47,966	19,092
International & Great Northern	1,160	662,894	125,981	851,638	126,943	150,215	21,229	369,447	2,865	29,964	700,664	150,974	40,000	110,798	—37,719
Kansas City Southern	827	619,581	102,953	788,351	79,420	85,908	28,079	297,399	.....	39,838	522,970	265,381	48,189	216,774	—82,556
Lake Erie & Western	900	359,587	54,868	436,772	53,330	76,972	11,892	191,464	.....	13,227	346,885	89,886	20,000	69,881	33,004
Lehigh Valley	1,444	2,531,510	262,388	3,003,715	322,159	569,412	86,192	1,324,141	10,667	78,544	2,390,102	613,613	144,000	467,631	104,735
Long Island	398	259,812	456,640	830,157	116,844	125,838	8,810	441,915	7,789	29,023	730,220	99,937	77,645	22,288	14,379
Louisville & Nashville	5,034	2,962,327	854,158	4,126,431	661,912	843,186	117,450	1,454,531	17,259	104,303	3,191,483	934,948	191,451	743,242	—129,928
Maine Central	1,219	567,710	194,440	836,448	128,184	135,731	9,041	355,745	11,220	25,553	665,473	170,976	53,082	117,893	—48,075
Mobile & Ohio	1,122	692,581	92,291	839,705	68,915	108,554	37,553	334,764	2,358	26,725	578,869	260,836	33,153	227,521	72,667
Monongahela	75	79,009	1,788	82,466	12,262	11,537	397	25,468	.....	2,024	51,689	30,777	1,810	28,967	—22,553
New Orleans & North Eastern	204	219,691	41,490	290,000	27,521	49,578	9,591	113,704	5,082	12,252	217,727	72,273	14,500	57,773	28,543
New Orleans Great Northern	283	91,169	18,612	122,470	18,105	19,020	2,389	37,659	186	6,384	83,743	38,727	3,150	35,577	—19,731
New York, Chicago & St. Louis	568	825,331	85,870	946,234	96,712	162,898	47,689	510,351	4,444	21,229	843,323	102,911	40,000	62,868	55,927
New York, New Haven & Hartford	2,003	2,225,990	1,946,684	4,721,801	448,701	772,609	31,612	2,027,999	56,320	127,129	3,463,670	1,258,132	200,000	1,057,938	606,705
New York, Philadelphia & Norfolk	112	190,809	35,281	247,581	27,054	56,874	3,943	125,379	4,513	10,291	228,053	19,528	9,500	10,028	—2,752
Norfolk Southern	900	191,987	74,467	288,899	37,741	52,534	7,591	122,859	85	20,253	241,062	47,837	9,460	38,377	—62,809
Northern Pacific	6,499	2,728,647	901,117	4,026,534	399,676	503,984	82,007	1,543,292	67,839	90,821	2,620,764	1,405,770	372,943	1,032,445	111,351
Pennsylvania *Company*	1,757	2,347,935	749,059	3,499,060	531,061	790,488	70,413	1,596,825	34,880	117,409	3,141,076	357,984	357	99,214	—401,694
Pennsylvania *Railroad*	4,512	9,461,174	2,842,196	13,617,879	2,047,946	3,228,797	165,917	5,713,957	220,410	426,692	11,803,720	1,814,159	638,586	1,175,072	—350,101
St. Louis, Brownsville & Mexico	548	95,191	54,301	166,168	30,145	21,602	5,434	66,783	.....	10,990	13,455	31,612	6,500	25,112	—12,537
Seaboard	3,101	1,128,833	363,874	1,712,168	194,420	254,708	60,938	678,878	13,676	60,166	1,262,787	449,380	86,004	362,625	—206,263
Southern in Mississippi	281	51,093	24,434	85,587	21,418	7,063	2,870	39,659	.....	3,674	74,684	10,903	8,375	2,526	—34,450
Southern Pacific	6,517	3,910,143	1,970,660	6,631,365	722,234	1,119,777	174,958	2,447,834	124,746	226,234	4,774,145	1,857,219	412,423	1,443,396	32,854
Toledo, St. Louis & Western	451	329,135	22,279	377,614	38,903	54,825	18,091	163,282	.....	7,846	282,947	94,667	17,864	76,803	—10,808
Union R. R. of Pennsylvania	31	.....	.....	141,435	61,095	77,184	100	108,726	.....	2,685	249,790	—108,355	5,300	—113,656	—21,156
West Jersey & Seashore	356	131,314	187,749	358,393	83,137	73,184	8,420	209,423	2,667	14,823	391,654	—33,262	28,693	—62,059	—33,500
Wheeling & Lake Erie	459	239,096	40,995	313,143	32,330	85,078	7,672	163,946	1,169	15,158	305,352	7,790	29,784	—21,994	—141,569

REVENUES AND EXPENSES OF RAILWAYS

SEVEN MONTHS OF FISCAL YEAR ENDING JUNE 30, 1915

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance									
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Alabama & Vicksburg	143	$566,227	$255,391	$906,820	$139,419	$225,998	$25,933	$340,903	$20,571	$39,637	$792,460	$114,359	$51,786	$62,574	—$138,200
Ann Arbor	294	966,639	338,811	1,394,958	152,086	191,179	34,315	557,692	2,946	52,241	990,459	404,498	90,560	313,563	—16,577
Atlanta, Birmingham & Atlantic	639	1,118,505	333,335	1,588,206	244,869	309,411	87,976	689,943	163	71,928	1,404,290	183,917	82,093	101,458	—235,757
Baltimore & Ohio Chicago Terminal	79	.....	4,292	938,916	93,224	134,662	6,167	399,795	15,882	32,749	679,268	259,648	133,148	126,419	24,302
Bangor & Aroostook	631	1,526,997	400,140	2,045,283	337,090	338,041	18,200	635,829	6,805	66,928	1,402,456	642,827	65,797	576,989	—61,141
Bessemer & Lake Erie	205	5,112,108	251,975	5,457,105	429,418	1,107,896	73,462	1,205,080	10,106	81,583	2,884,274	2,572,831	131,014	2,441,776	541,168
Birmingham Southern	44	284,636	6,951	514,515	111,523	88,532	3,410	196,795	.....	24,915	425,175	89,340	18,724	70,616	144,548
Buffalo & Susquehanna R. R. Corp.	253	811,642	49,319	882,790	167,456	264,366	8,749	262,941	.....	37,500	741,012	141,778	18,200	123,578	—100,942
Buffalo, Rochester & Pittsburgh	586	4,824,847	698,236	5,730,209	770,753	1,348,851	85,970	1,869,155	9,360	129,355	4,213,445	1,516,765	140,000	1,376,562	—564,835
Central of Georgia	1,924	4,692,287	1,898,728	7,336,412	1,009,047	1,388,406	239,868	2,583,549	8,983	237,585	5,444,407	1,892,005	322,661	1,566,637	—537,947
Central New England	304	1,835,228	287,170	2,226,329	501,334	246,266	8,176	761,105	.....	26,100	1,542,682	683,646	80,002	603,610	—187,871
Chesapeake & Ohio Lines	2,368	17,713,548	3,535,169	22,641,354	2,617,595	4,841,121	384,953	7,492,980	143,582	510,248	15,990,479	6,650,875	774,541	5,874,831	—234,045
Chicago & North Western	8,108	31,943,756	12,824,239	49,816,492	6,817,740	7,853,611	766,406	17,865,440	362,564	1,015,615	34,563,391	15,253,101	2,625,000	12,625,078	—898,168
Chicago Great Western	1,429	5,909,395	1,909,877	8,528,246	1,142,396	1,464,850	329,238	3,067,209	47,196	247,920	6,290,353	2,237,893	340,679	1,894,230	—45,162
Chicago, Peoria & St. Louis†	255	651,707	149,366	850,880	139,683	153,176	35,490	355,474	.....	31,602	715,425	135,455	34,200	101,255	168,178
Chicago, St. Paul, Minneapolis & Omaha	1,753	7,064,259	3,147,846	11,018,099	1,274,867	1,455,119	202,558	4,054,781	104,576	254,074	7,330,071	3,688,029	624,246	3,061,501	—24,860
Cincinnati, Hamilton & Dayton	1,015	4,288,276	934,009	5,842,929	847,223	1,162,253	142,129	2,616,414	20,715	135,157	4,922,808	920,121	257,262	661,105	98,330
Cincinnati Northern	246	765,682	137,107	942,143	136,501	181,351	18,957	308,990	.....	24,362	670,161	271,981	36,963	234,737	266,560
Cleveland, Cincinnati, Chic. & St. Louis	2,381	14,506,971	5,167,050	21,584,413	2,301,835	4,204,748	555,071	8,249,838	169,551	432,621	15,879,980	5,704,433	909,027	4,786,435	2,729,179
Colorado Midland	338	896,638	154,195	1,168,051	181,156	247,550	53,557	458,223	8,700	39,693	988,880	179,171	59,709	119,462	107,051
Cumberland Valley	164	1,228,502	405,673	1,732,731	307,879	240,558	31,049	604,118	5,931	57,276	1,246,811	485,921	39,864	446,057	—87,338
Delaware, Lackawanna & Western	960	18,055,974	5,132,796	25,695,339	2,860,759	4,124,548	485,367	8,129,355	219,625	523,123	16,168,339	9,527,000	1,137,432	8,388,259	—55,629
Elgin, Joliet & Eastern	776	4,521,698	39	4,808,123	497,050	931,315	40,126	1,468,087	.....	129,158	3,065,397	1,742,726	238,240	1,504,453	—496,587
Florence & Cripple Creek	87	579,936	113,690	704,926	75,720	67,053	14,567	208,054	.....	28,714	394,107	310,819	38,675	272,144	—2,818
Florida East Coast	745	1,328,366	928,663	2,622,128	426,545	386,848	60,607	905,633	20,929	120,814	898,141	723,987	134,000	589,179	275,509
Illinois Central	4,769	27,118,588	7,924,876	37,903,149	5,091,055	8,239,886	733,176	13,600,107	211,975	887,082	28,560,967	9,342,182	1,907,000	7,422,520	—90,107
Indiana Harbor Belt	110	.....	.....	1,942,503	265,061	183,579	19,218	844,247	.....	53,331	1,365,435	577,068	53,357	523,081	158,684
International & Great Northern	1,160	4,116,499	1,158,055	5,675,094	912,461	936,270	163,901	2,464,090	20,126	209,459	4,706,367	968,788	220,000	748,295	—711,798
Kansas City Southern	827	4,618,364	893,946	6,076,927	665,377	724,121	205,234	2,042,429	.....	298,516	3,915,538	2,161,389	333,468	1,825,753	—310,558
Lake Erie & Western	900	2,703,257	476,985	3,354,281	464,698	571,809	99,316	1,352,603	.....	85,956	1,574,383	779,898	166,541	612,381	152,626
Lehigh Valley	1,444	21,081,202	2,572,417	25,120,743	2,756,027	4,965,940	545,531	9,075,172	88,187	507,415	17,936,593	7,184,149	985,000	6,190,939	—207,394
Long Island	398	2,201,166	4,831,748	8,095,238	822,482	828,048	84,540	3,345,248	51,102	193,875	5,325,294	2,769,944	474,830	2,293,039	524,674
Louisville & Nashville	5,034	22,095,671	6,704,573	30,970,710	4,911,827	6,357,778	786,966	10,645,294	111,944	722,779	23,501,156	7,469,554	1,297,167	6,169,096	—2,004,657
Maine Central	1,219	4,077,414	2,175,212	6,746,841	984,764	1,032,188	79,462	2,556,247	46,002	187,243	4,885,905	1,860,936	359,607	1,501,186	30,553
Mobile & Ohio	1,122	5,305,143	781,642	6,480,469	672,106	1,141,283	283,731	2,515,730	18,565	203,513	4,834,928	1,645,541	217,426	1,427,394	—196,264
Monongahela	75	577,917	14,784	604,856	112,901	52,684	4,228	163,558	.....	14,147	347,517	257,338	11,218	246,121	—254,816
New Orleans & North Eastern	204	1,537,468	324,337	2,048,336	217,335	426,407	68,102	731,762	40,551	82,698	1,566,854	481,482	102,990	378,492	—61,044
New Orleans Great Northern	283	677,109	178,200	740,011	120,240	139,875	18,451	288,689	1,266	45,608	614,128	325,883	20,150	305,717	—134,726
New York, Chicago & St. Louis	568	5,523,154	854,780	6,678,303	831,498	839,618	295,608	3,051,331	36,336	138,243	5,192,633	1,485,670	281,267	1,203,732	—8,100
New York, New Haven & Hartford	2,003	17,453,327	16,227,114	37,817,095	4,709,815	5,730,099	256,942	14,485,146	340,837	924,492	26,436,720	11,380,374	1,584,000	9,794,256	403,993
New York, Philadelphia & Norfolk	112	1,696,206	309,879	2,197,791	215,544	430,914	29,826	963,620	33,064	68,814	1,741,781	456,010	68,300	387,507	5,559
Norfolk Southern	900	1,420,642	657,169	2,252,737	307,367	363,537	52,369	851,684	609	139,160	1,714,728	538,009	77,511	459,133	—198,297
Northern Pacific	6,499	27,498,956	8,623,318	39,606,410	5,255,367	5,108,054	643,093	11,739,620	580,687	651,204	23,184,096	16,422,314	2,809,326	13,611,476	—1,528,506
Pennsylvania *Company*	1,757	22,694,220	5,920,270	31,935,771	4,741,542	5,895,473	538,627	11,873,749	258,405	786,364	24,094,160	7,841,611	1,844,324	5,996,301	—2,237,627
Pennsylvania *Railroad*	4,512	75,701,305	23,390,937	109,130,083	14,489,145	21,639,917	1,347,618	41,072,488	1,615,401	2,848,238	83,012,807	26,117,276	4,529,077	21,576,384	—1,037,599
St. Louis, Brownsville & Mexico	548	758,827	436,861	1,315,427	247,412	150,896	36,647	504,627	.....	75,861	1,006,956	308,470	43,923	264,547	11,673
Seaboard	3,101	8,109,182	2,658,314	12,082,362	1,437,718	1,840,760	447,336	4,529,300	55,533	384,743	8,693,132	3,389,229	632,145	2,753,025	—1,064,429
Southern in Mississippi	281	386,436	208,165	653,283	155,164	61,700	17,120	288,844	.....	25,922	548,750	104,533	59,282	45,171	—97,951
Southern Pacific	6,517	35,309,004	16,116,900	56,851,874	5,661,862	8,084,032	1,123,784	18,285,917	946,465	1,622,356	35,589,730	21,262,144	2,882,921	18,362,847	—2,582,447
Toledo, St. Louis & Western	451	2,276,505	204,320	2,669,585	331,336	415,414	115,825	1,045,334	.....	60,062	1,967,971	701,614	173,252	528,362	—303,748
Union R. R. of Pennsylvania	31	.....	.....	2,071,778	311,099	678,704	709	897,465	.....	23,584	1,911,561	160,216	19,472	140,744	—290,110
West Jersey & Seashore	356	1,082,847	2,661,560	4,114,662	652,885	601,444	85,907	1,697,752	19,750	93,619	3,151,357	963,305	200,096	762,943	51,827
Wheeling & Lake Erie	459	2,533,914	352,684	3,180,974	355,611	590,243	61,956	1,223,348	9,206	104,904	2,345,269	835,706	221,134	614,572	—748,271

†Figures shown are for 6 months.

Traffic News

The Panama canal has been blocked for nearly a week by landslides. When it was cleared, on Wednesday of this week, 27 ships went through in one day.

Railroads east of Chicago have filed tariffs with the Interstate Commerce Commission increasing lake and rail rates and ocean and rail rates where they are intimately related to the all-rail and lake-and-rail rates by about 5 per cent, effective on March 27 and later dates.

Protests against proposed freight rate increases asked by the Missouri railroads were heard by the Missouri Public Utilities Commission at a hearing in Kansas City on March 5. A committee representing manufacturers, produce and stock dealers, appeared before the commission.

The railroads of South Texas expect within the next month or two to carry northward more than 4,500 carloads of Bermuda onions. The land devoted to onions aggregates 7,850 acres, of which 4,200 acres is in the Laredo district. The principal shipments will originate on the International & Great Northern and the St. Louis, Brownsville & Mexico roads.

Governor Philipp of Wisconsin is reported as saying that if the legislature of Wisconsin should pass a bill allowing passenger fares to be put on the basis of 2½ cents a mile, he would veto the measure.

George B. Haynes, general passenger agent of the Chicago, Milwaukee & St. Paul, C. A. Cairns, general passenger agent of the Chicago & North Western, and James C. Pond, assistant general passenger agent of the Minneapolis, St. Paul & Sault Ste. Marie, this week began a speaking campaign in Wisconsin for the proposed advance in passenger fares from 2 to 2½ cents a mile, addressing first a meeting of the Merchants' and Manufacturers' Association of Milwaukee, on Monday.

The foot-and-mouth disease continues to interfere with livestock traffic at many places. Quarantines established two or three weeks ago are being lifted, here and there, but new quarantines are imposed. The state of Pennsylvania has put restrictions on the transit of animals through the state, causing much complaint at New York City. It is said that the New York Central and the New York, Chicago & St. Louis have disregarded this state quarantine. At Richmond, Va., an injunction was issued against certain transportation companies which violated the state quarantine. In Kentucky a single herd of cattle valued at $60,000 was destroyed; and the same course was taken with a herd worth $50,000 at Haddonfield, N. J. At Worcester, Mass., it was reported that a number of men had been infected with the disease.

Officers of Canadian railroads appeared before the Canadian Board of Railroad Commissioners on March 1 to offer testimony in support of their application for a general increase in freight rates. H. G. Kelley, vice-president of the Grand Trunk, testified that wages had been increased 23.19 per cent in 1914 over 1909. He gave other testimony regarding increases in wages and in the cost of supplies and of operation. C. E. Dewey, freight traffic manager of the Grand Trunk, gave detailed testimony regarding the rates which it is proposed to increase. E. W. Beatty, vice-president and general counsel of the Canadian Pacific, also presented statistical testimony on behalf of his road to show the need for an increase in rates. Counsel for the Dominion government announced that the government was opposed to an increase in rates at this time. The board will hold hearings at various places to discuss the rates on different commodities.

W. S. St. George, general passenger agent of the Missouri, Kansas & Texas, in an interview in reply to a statement issued by the Oklahoma Corporation Commission which gave figures to show that the railroads of the state are making more money under the two-cent passenger fare than under the three-cent fare, based on passenger earnings for four months, says that most of the increases shown in the statement resulted from two causes. First, the re-buying of tickets at border points to evade the higher interstate fares, and, second, increased travel resulting from a general increase in business and developments within the territory. "On the Missouri, Kansas & Texas," he said, "47 per cent of all selling stations during the four months of 1914 quoted in the commission's statement showed a decrease in passenger receipts as compared with the previous period, and of 53 per cent showing an increase only 41 per cent showed an increase of over 10 per cent." Some of the border stations, he said, showed an increase of nearly 300 per cent in 1914 as compared with 1912 because of the buying of tickets at border points.

Michigan Commissioner Finds Earnings Too Low

Lawton T. Hemans, chairman of the Michigan railroad commission, appeared before the railroad committees of the Senate and House of the Michigan legislature on March 4, and told them that the statistics submitted by the railroads in support of the request for an advance in passenger fares were substantially correct "From such information as we have been able to reach," he said, "we are bound to say that for a period of 10 years the railroads have not been earning sufficient income for the services rendered. We are led to this conclusion by the reports and the opinions of the Interstate Commerce Commission as well as from railroad reports in our department. These reports are sworn to and we have every reason to believe that they are substantially correct. Our conclusion is that while in the past decade there has been an increase in the cost to the railroads of freight and passenger transportation, there has been a decrease in the rates for both of these services. Thirty-three out of fifty-six Michigan railroads are earning from their passenger service sums insufficient to pay interest on the passenger service proportion of their bonded debts."

Travel to the San Francisco Exposition

The Southern Pacific is now under contract to carry within the immediate future over 15,000 visitors to the Panama-Pacific International Exposition at San Francisco. To move these people, 104 special trains will be required, these being distributed through the El Paso, Ogden and Portland gateways. Other reservations for cars are coming in as fast as they can be handled.

In addition to the 104 special trains, the Southern Pacific has made arrangements for moving upwards of 40 private cars with their parties, and from now on up to the month of August every one of its 10 limited and express trains from eastern connections will be run with from one to three extra sections. Four of these regular expresses run through Ogden, three via Portland, and three via El Paso. This means an increase in regular daily train service from the East of from 10 to 30 or 40 trains.

From data which has been compiled it is expected by the company that the greatest number of transcontinental visitors will reach San Francisco during June, July and August. H. R. Judah, assistant general passenger agent, estimates that the 550 conventions to be held during the season of the exposition will attract between 700,000 and 800,000 people to San Francisco.

Car Surpluses and Shortages

The American Railway Association's Committee on Relations Between Railroads, Arthur Hale, chairman, has issued statistical statement No. 2, giving a summary of freight car surpluses and shortages for March 1, 1915, with comparisons. The total surplus on March 1, 1915, was 304,284; on February 1, 1915, 280,573, and on March 1, 1914, 159,480.

The surplus for February 1, 1915, shown above includes figures reported since the issue of statistical statement No. 1 (published in the *Railway Age Gazette* of February 19, page 343) and confirms the estimate made therein.

The increases over February 1 are chiefly in the west and central south. The total shortage on March 1, 1915, was 297; on February 1, 1915, 1,162, and on March 1, 1914, 5,573.

The figures by classes of cars follow:

Classes	Surplus	Shortage
Box	78,686	50
Flat	20,592	41
Coal and gondola	158,293	14
Other	46,713	192
Total	304,284	297

Commission and Court News

INTERSTATE COMMERCE COMMISSION

A hearing before George N. Brown, examiner attorney for the Interstate Commerce Commission, on the proposed charges for trap car service was held at Detroit on March 3 and 4.

The Chicago, Milwaukee & St. Paul has filed a formal complaint with the Interstate Commerce Commission against the Great Northern, alleging that the Great Northern unduly discriminates against it by refusing to make through routes and joint rate arrangements with it for the carriage of passengers to and from British Columbia and Washington via Seattle.

International Rates on Pulp Wood

International Paper Company et al. v. Delaware & Hudson et al. Opinion by Commissioner Clark:

Complaint is made against the reasonableness of an increase of generally one cent per 100 lb. made in August, 1913, in the rates on pulpwood from points in Canada on the Canadian Pacific, Grand Trunk, Intercolonial, Canadian Northern and Temiscouta to points in eastern and northern New York. These increased rates had already been found reasonable by the Board of Railway Commissioners for Canada on a complaint by the same parties. The rates were primarily established by the Canadian carriers for transportation, largely in Canada, and the increases accrue, almost wholly to them. For these reasons the commission believes that no relief should be granted. (33 I. C. C., 270.)

Proposed Increase in Freight Storage Rates at New York

C. V. Burnside, examiner for the Interstate Commerce Commission, took testimony at New York City March 4, 5 and 6 concerning the proposed increase in charges for storage and lighterage the tariffs for which were suspended by the commission. The new tariffs provided for charges for switching at numerous places where at present this service is performed free. One of the proposed changes was a new item in the tariffs making a charge of twelve cents a ton for the delivery of freight in Manhattan at docks other than those of the railroad companies. A large share of the freight coming to New York City reaches the west side of the Hudson River by rail, and the cars are taken from the trains directly to floats and carried across the river; and the freight is unloaded directly at the railroad company's piers. Freight going to other piers must in most cases be unloaded from the cars at Jersey City or Hoboken and taken across the river by lighter or by wagons on the decks of ferry boats.

Another important change proposed is a reduction from ten days to five days in the time allowed for free storage of flour. The flour merchants declare that the profit on their transactions is so small that the addition of a charge for storage heretofore given by the railroads for nothing, will greatly impair and in some cases destroy their business.

The Merchants' Association was represented at the hearing by J. C. Lincoln, and the city government by the corporation counsel, F. L. Polk; numerous large shippers and manufacturers were represented.

The contention of the railroads is that all the proposed charges are reasonable; while the city and local interests argue that conditions in New York City are so different from those in other places that no general rule can apply; the need of additional time to unload flour, so as to provide for delays in transportation, for bunching and for making adjustments with the final receivers of the freight, who have very limited storage room, makes it out of the question to pay the carriers any more than is now paid.

Jobbers in flour say that it is necessary that there shall be usually in New York City a reserve stock of about 20,000 barrels; this to provide for irregularities in arrival, etc.; and they say that a reduction of five days in the free storage time would force them to reduce this stock to 5,000 barrels. No fair comparison can be made with the rates in other cities because the conditions are different. In Philadelphia cars are taken directly to the doors of warehouses; but in New York this is out of the question.

Testimony was given on behalf of the flour merchants to the effect that the proposed charge of one cent per 100 lb. for each ten days on flour, equal to six cents per barrel per month, would be about twice the prevailing charge for keeping flour in public storehouses, which is three cents per barrel per month (though for the first month there is a charge of three cents a barrel for labor).

The present liberal practices of the railroads in connection with flour at New York City are of long standing. In 1902 the railroads allowed sixty days' free storage. After a time this was reduced to thirty days; then to twenty days and finally the present limit, ten days, was adopted about six years ago.

At a continuation of the hearing on Monday of this week Mr. Lincoln described the track facilities and the customs in freight handling in Chicago, to show the superiority of the system of distribution of freight provided in that city.

P C. Staib, a wholesale grocer, declared that it would be impossible, as a rule, to move freight from the piers in New York to the consignees' warehouses within 48 hours of its arrival, which is the limit of the period for which the roads propose to allow free storage. The draymen of the city are not equal to the task of removing freight so rapidly.

An inspector of the New York State Public Service Commission, testifying concerning freight, largely structural steel, coming to the city to be delivered to contractors working on the new subways, said that the proposed charge of twelve cents a ton for the delivery of freight from lighters at points other than railroad company's piers, together with the additional charge of forty cents a ton on heavy pieces, would add to the cost of the city's subways about $104,380. The American Bridge Company presented a similar protest.

STATE COMMISSIONS

The Railroad Commission of Mississippi has imposed on the Illinois Central a fine of $500 for ignoring an order of the commission forbidding the collection of ten cents additional from passengers paying fares on the trains.

The Railroad Commission of South Carolina on March 3 issued an order making sweeping reductions in the rates for transportation of merchandise by express in that state. At the same time it was announced that hearings would be held concerning proposed changes in rates on other merchandise, not affected by the present order.

The Long Island road has appealed to the courts from the order of the New York Public Service Commission, First district, requiring it to put on two additional trains in the Manhattan-Far Rockaway service, and one additional train on the Atlantic division, and to have certain trains stop at St. Albans station on the Montauk division. The company has obtained a writ of certiorari from the Supreme Court for a review of the commission's action.

The Oregon Railroad Commission has been obliged to retrench because its appropriation for the next two years was reduced by the legislature to $25,000. It is announced that the chief electrical engineer, the auditor, the assistant secretary and the stenographer, are to be dismissed on April 1, and that other reductions in its staff are expected to follow. The commission's appropriation for the past two years has been $80,000, and for the two years before that was $105,000.

The New York State Public Service Commission, Second district, has decided in favor of William A. Wadsworth of Geneseo, in his complaint against the Erie Railroad for not maintaining his farm crossing. The crossing consists of a bridge over the tracks, and it has existed for about 60 years; but recently when it became necessary to build a new bridge the railroad notified Mr. Wadsworth that he himself would have to bear the expense; and a barricade was put across the present structure. The road claimed the commission had no jurisdiction in such a case; but, in an opinion by the chairman, it holds that, whatever its power as to originally establishing a farm crossing—although it believes it has such authority—it plainly has jurisdiction in a matter

like the present case, where the crossing has already been constructed and has been so long in use.

PERSONNEL OF COMMISSIONS

Joseph Pryor, assistant chief engineer of the Illinois Public Utilities Commission, has been appointed acting chief engineer, succeeding R. M. Feustel, resigned.

Charles C. Elwell, engineer of the Connecticut Public Utilities Commission, has been nominated by the governor (and confirmed) as a member of the commission, in place of T. B. Ford, to take office July 1, next. Mr. Elwell was born in 1855 at Belfast, Me., and was graduated from the University of Maine in 1878. He began railroad work in 1882 as assistant engineer on the New York & New England, and subsequently served in a similar capacity on the Philadelphia & Reading, the Baltimore & Ohio and the New York, New Haven & Hartford. On the latter road he was in charge of four tracking work between New York and New Haven from 1893 to 1895, and in the latter year was promoted to the position of superintendent at Norwich, Conn. In 1908 he was made engineer of electric lines controlled by the New Haven, which position he held three years. In 1911 he was appointed engineer of the state commission. He is a member of the American Society of Civil Engineers, and has just been elected president of the Connecticut Society of Civil Engineers.

COURT NEWS

A special court, consisting of Judges Kohlsaat, Landis and Geiger of the United States Court at Chicago, has declined to issue an injunction at the request of the Duluth & Northern Minnesota to prohibit the Interstate Commerce Commission from enforcing its orders reducing rates on logs and pulp wood on this road, which lies wholly within the state of Minnesota. The court held that, inasmuch as the logs and other commodities carried by the road were intended for shipment beyond, the road was engaged in interstate commerce within the meaning of the act; and as to the plea of confiscation, that the court may not hear testimony tending to show that the order results in confiscation of the carrier's property unless the commission has refused to hear such testimony.

Liability for Fires—Proximate Cause

In an action for damages by fire to the plaintiff's factory, it appeared that the fire was started by railroad laborers on the defendant's right of way for their own purposes, and there was no evidence that certain combustibles which the defendant had permitted to accumulate on the right of way became ignited and thereby communicated the fire to the plaintiff's property. The Missouri Supreme Court held that the negligence, if any, of the railroad company in permitting the accumulation was not the proximate cause of the fire. The court also held that the Missouri statute making railroads liable for fires started by engines and those communicated by the ignition of dry vegetation negligently permitted to remain on the right of way, does not make a railroad liable for a fire kindled by its laborers on the right of way outside the scope of their employment (in this instance to heat water to wash their clothes), and communicated directly to adjoining property without the ignition of rubbish upon the right of way.—Excelsior P. Mfg. Co. v. Kansas City Southern (Mo.), 172 S. W., 359.

Right to Refund—Conditions

In an action in the Oklahoma courts for a refund under a milling-in-transit arrangement, it appeared that the plaintiff, a lumber company, at different times between May, 1907, and February, 1908, shipped rough lumber to a milling point on the defendant's line. At the time a milling-in-transit privilege was given by the defendant's tariff, under which the finished product was required to be shipped out in certain quantities to destinations on the defendant's line, and under certain named tariffs carrying specified freight rates then in force. Before the plaintiff shipped out any of the lumber, that tariff on intrastate shipments had been canceled, and lower rates established to conform to an order of the State Corporation Commission; and thereafter the plaintiff shipped under such lower rates. The Oklahoma Supreme Court held that, not having complied with the conditions under which the right to a refund on inbound shipments was given, the plaintiff was not entitled to the benefit of it. Its right to a refund was dependent on the shipper causing the lumber to be moved under the existing tariffs. When this was not done, but, instead the lumber was shipped out under reduced rates, put in force by lawful authority, an action to recover such refund could not be maintained.—St. Louis & S. F. v. Walton-Chandler Lumber Co. (Okla.), 145 Pac. 340.

Employers' Liability Act—Interstate Commerce

The Wisconsin Supreme Court holds that a brief incidental absence from the scene of work, which is not inconsistent with the employee's duty to his employer, does not necessarily invalidate his claim to be still on duty and engaged in interstate commerce. A brakeman finished his regular duties, after a run between two state points on a train which had some interstate cars in it. He went to a saloon, and from there started to cross over a train to go to the station and learn if the conductor had any further orders for him. While crossing the train he was injured. The court held that he was employed in interstate commerce.—Graber v. Duluth, S. S. & A. (Wis.), 150 N. W., 489.

A laborer on a trestle, used by a railroad company in interstate commerce, boarded and slept in a bunk car furnished by the company, and which was moved about as the place of work was changed. The actual board was furnished by the foreman in charge of the work. The men went to and from the boarding cars sometimes on push cars and sometimes on foot. The laborer in question was injured while walking along the tracks to the cars after finishing his day's work. In an action against the company it was held by the Kentucky Court of Appeals that he was engaged in interstate commerce within the meaning of the federal employers' liability act, the course of his employment covering not only the time he was actually engaged at work, but the time he was engaged in going to and from his work.—Louisville & N. v. Walker (Ky.), 172 S. W., 517.

Duty Towards Licensees Walking Near Tracks

Action was brought for injuries to a boy 15 years of age, and weighing about 100 pounds, who was drawn beneath a freight train moving from 25 to 30 miles an hour while he was walking along a pathway alongside the defendant company's tracks. The Kentucky Court of Appeals assumed that the boy was a licensee and not a trespasser, so that the question sharply presented was: Does a railroad company owe to a licensee walking near its tracks, and who knows of the approach of the train, the duty of slackening the speed of its train to prevent him from being sucked under it? Witnesses had never heard of such an accident but, says the court, this does not show that such an accident had never happened, or that it should not have been anticipated; yet this rule is not without qualification. Every day hundreds of trains are run at the rate of 25 to 30 miles an hour. These trains pass hundreds and perhaps thousands of persons standing within five or six feet of the track. If the suction from trains were great enough to draw persons under them, there would have been innumerable accidents of the kind under consideration. Notwithstanding this fact, several railroad men, who certainly had an opportunity to speak from long experience, say that they never heard of a live object, capable of resisting, being sucked under a train. Not only so, but the only two cases that have ever come before the courts, so far as the court knew, are the case under consideration and the case of Graney v. St. Louis, I. M. & S., 157 Mo., 666, 57 S. W., 276, 50 L. R. A., 153, where a recovery was denied on the ground that the accident, even if it took place as claimed by the plaintiff, was not one that might have been reasonably anticipated. Where, in a case like this, it is contended that the accident was the result of the negligence of the railroad company, combined with a natural law, and where not only the character of the accident, but the conditions attending the every-day operation of trains, are such that the accident would have frequently happened if the natural law were such as to make it possible, evidence to the effect that no such accident had ever happened has a strong and important bearing on the question whether or not it should have been reasonably anticipated.

Even assuming the possibility of such an accident, the court

held the probability of its occurrence to be so remote that it could not be said to be an accident which should, in the exercise of ordinary care, be reasonably anticipated by those operating railroad trains. That being true, a railroad company does not owe the licensees walking along the side of its tracks, and who know of the approach of its trains, the duty of moderating the speed of the trains so as to prevent their being sucked under the cars.—L. & N. v. Lawson (Ky.), 170 S. W., 198.

Interchange of Cars and Freight

The Illinois Central sought to enjoin the enforcement of an order of the Louisiana Railroad Commission, regulating interchange of traffic. This order (No. 295) would require a railroad, upon demand of a carrier or shipper, and on terms fixed by the state commission, to switch empty cars from a competing interstate railroad to a designated side track within its own terminals for the purpose of being loaded there with goods intended for interstate commerce, and when so loaded to move the same back to the competitor's line for transportation to another state. The company would also be required to accept from competing interstate lines, at points within the city, loaded cars brought from other states, and place them on its own side track, although such track was the real destination contemplated at the time of the original shipment. The United States Supreme Court holds that switching movements of this kind constitute a part of interstate commerce, the regulation of which Congress has undertaken, and consequently the order of the state commission transcends the limits of its powers.

When freight actually starts in the course of transportation from one state to another it becomes a part of interstate commerce. The essential nature of the movement, and not the form of the bill of lading, determines the character of the commerce involved. And generally, when this interstate character has been acquired, it continues, at least, until the load reaches the point where the parties originally intended that the movement should finally end. Illinois Central v. De Fuentes, 35 Sup. Ct., 275.

West Virginia Two-Cent Fare Law

The United States Supreme Court on Monday of this week, in the suit of the Norfolk & Western, declared unconstitutional, as affecting that road, the law of West Virginia limiting passenger fares to two cents a mile. The decision was by Justice Hughes, who said:

"In making a reasonable adjustment of the carrier's charges, the state is under no obligation to secure the same rate of return from each of the two principal departments of business, passenger and freight, but the state may not select either of these departments for arbitrary control.

"In this case it is apparent, from every point of view, that the statutory rate, at most, affords a very narrow margin over cost. It is clear that by the reduction in rates, the company is forced to carry passengers, if not at or below cost, with merely a nominal reward, considering the volume of the traffic affected. We find no basis whatever upon which the rate can be supported, and it must be concluded, in the light of the principles governing the regulation of rates, that the state exceeded its power in imposing it."

The attorney general of the state contended that the 2-cent rate prescribed by the state law of 1907 should be taken in connection with the freight rates authorized in 1895 by the legislature and that passenger earnings cannot be segregated and considered apart; that all classes of railroad business need not be equally remunerative; that as the railroad company is earning between 6 and 8 per cent on its entire investment if its passenger business is not remunerative its freight traffic must be more than remunerative.

In deciding the case the court declared, as above, that the statutory rate, at most, affords a very narrow margin. "It is manifestly not a case where we are asked to enter the domain of legislative discretion, nor is it one in which it is necessary to determine the value of the property employed in intrastate business. . . ."

The Norfolk & Western brought suit in the Circuit Court of Kanawha county, W. Va., in 1909 to restrain the officers of the state from further enforcement of the law. At the old rate the road estimated that it was receiving a return of 3.7 per cent on its passenger business. For the fiscal year ending June 30, 1908, the first year the law was in operation, the return on its passenger business fell to 1.04 per cent per annum and the following fiscal year to 0.38 per cent.

In addition to these facts the road presented the claim that the penalties prescribed for disobedience were so heavy as to amount to denial of due process of law; and that the law was unconstitutional because it imposed the burden of the lower rate on roads whose mileage exceeded fifty miles while exempting shorter roads.

North Dakota Coal Rate Law Annulled

The Supreme Court of the United States, on Monday of this week, in the cases of the Northern Pacific and the Minneapolis, St. Paul & Sault Ste. Marie declared unconstitutional the law of North Dakota limiting freight rates on lignite coal.

The decision was by Mr. Justice Hughes, who has written most of the important decisions of the Supreme Court in rate cases recently. Justice Hughes lays down the principle that a state cannot select a particular commodity, coal, for example, on which to fix a rate, justifying itself by the fact that the return from a railroad's entire intrastate business is remunerative. The state has broad powers over railroads, but it does not enjoy the rights of an owner.

This case came before the court on appeal from a decision of the Supreme Court of North Dakota. The law was passed in 1907, and the carriers refused to obey it. A test case was begun, and in 1909 the Supreme Court of North Dakota handed down a decision that the rates were reasonable, and that the proper test of their reasonableness was whether they, with other rates on other commodities in intrastate transportation, gave the carrier a reasonable return on its business.

This decision was affirmed by the Supreme Court of the United States in 1910, but with the proviso that if after a trial of the rates they were still found to be confiscatory, the carriers might come into court and have another opportunity to prove that contention.

The rates were put into effect in 1910. Again the railroads, after a year's test of the rates, went into court to contest the law. The Supreme Court of North Dakota then held that in the case of the Northern Pacific the rates were "slightly remunerative, but in fact non-compensatory," and in the case of the other road "more than the actual costs of transportation," but less than the fixed and overhead charges "properly chargeable to the carriage of this commodity."

The court held that the rates were not confiscatory because to prove confiscation it must be shown that the rates are so low as to make a carrier's entire intrastate business unprofitable, after it should be demonstrated by valuation of the company's property what portion thereof was devoted to intrastate traffic. The court in addition held that it must be reasonably certain that the loss on the commodity in question reduces the total net freight earnings to a point where they as a whole fail to yield a fair return. The carriers declared it was impossible to answer such a question and again appealed to the Supreme Court of the United States for relief.

Justice Hughes said, further:

"The general principles to be applied are not open to controversy. The railroad property is private property devoted to a public use. As a corporation, the owner is subject to the obligation of its charter. As the holder of special franchises, it is subject to the conditions upon which they were granted. Aside from specific requirements of this sort, the common carrier must discharge the obligations which inhere in the nature of its business. It must supply facilities that are reasonably adequate; it must grant reasonable terms, and it must give service without unjust discrimination.

"But the fact that the property is devoted to a public use on certain terms does not justify the requirement that it shall be devoted to other public purposes, or to the same use on other terms, or the imposition of restrictions that are not reasonably concerned with the proper conduct of the business according to the undertaking which the carrier has expressly or impliedly, assumed. As a carrier for hire, it cannot be required to carry persons or goods gratuitously. The case would not be altered by the assertion that the public interest demanded such carriage. In such a case it would be no answer to say that the carrier obtains from its entire business a return as to the sufficiency of which it is not entitled to complain."

Railway Officers

Executive, Financial, Legal and Accounting

W. H. Sparger has been appointed auditor of the Oil Belt Railway, with headquarters at Jennings, Mo.

G. W. Alexander has been elected treasurer of the Detroit Terminal, with office at Detroit, Mich., vice W. E. Hackett.

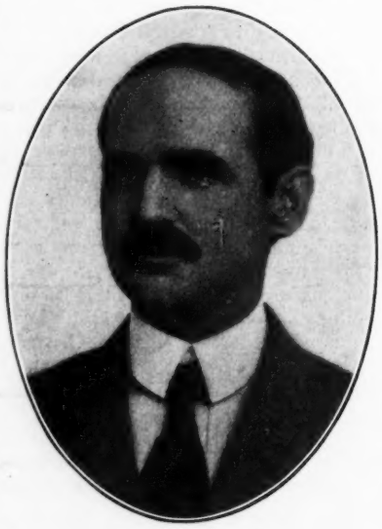
Henry C. Ferris, of Muskogee, Okla., has been appointed co-receiver with Alexander New of the Missouri, Oklahoma & Gulf, vice Louis S. Posner, resigned.

Pending the return of T. J. Kennedy from abroad and his qualifying as co-receiver, Vivian Harcourt has been appointed sole acting receiver of the Algoma Central & Hudson Bay, with headquarters at Sault Ste. Marie, Ont.

Alberto J. Pani, vice-president of the National Railways of Mexico, at Mexico City, Mex., has been authorized by the executive committee of the company to assume the duties of president, due to the absence of Luis Cabrera, and Charles R. Hudson, vice-president at Mexico City, has severed his connection with this company.

The Continental Trust Company has resigned as co-receiver of the Denver, Laramie & Northwestern, and Marshal B. Smith is now sole receiver, with headquarters at Denver, Col. J. R. McCoy, assistant auditor at Denver, has been appointed auditor in charge of accounts, and his former position has been abolished.

William Alfred Worthington, vice-president and assistant director of maintenance and operation of the Southern Pacific Company, at New York, has been appointed vice-president and assistant to chairman, with headquarters at New York. Mr. Worthington was born on June 18, 1872, at Vallejo, Cal., and was educated in the public schools af Sacramento. He began railway work on March 1, 1887, with the Southern Pacific, and has been in the continuous service of that road ever since. He served as stenographer and clerk in the superintendent's office at Sacramento until June, 1888, and then became chief clerk to the engineer of maintenance of way at San Francisco. In October, 1893, he was appointed statistician in the general manager's office at San Francisco, and two years later was made chief clerk of the same office. From October, 1901, to April, 1904, he was executive secretary to assistant to president of the same road at San Francisco. Mr. Worthington went to Chicago in April, 1904, as chief clerk to the director of maintenance and operation of the Union Pacific System and the Southern Pacific Company. In November, 1907, he was appointed assistant to director of maintenance and operation at Chicago, and from January 1, 1912, to February, 1913, was assistant director of maintenance and operation of the same roads, with headquarters at New York City. In February, 1913, when the Union Pacific and Southern Pacific were separated under an order of the federal court, he resigned from the Union Pacific and was elected vice-president and assistant director of maintenance and operation of the Southern Pacific Company, which position he held at the time of his recent appointment as vice-president and assistant to chairman of the same road, as above noted.



W. A. Worthington

Operating

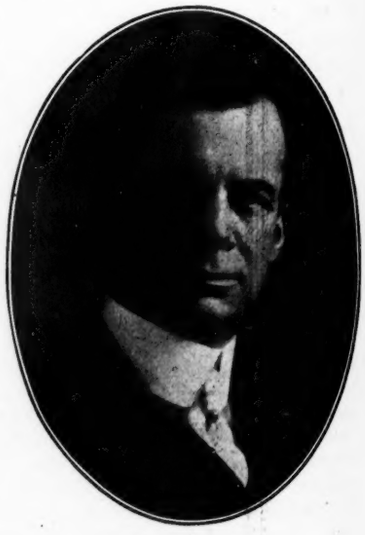
R. S. Toucey, assistant superintendent of the Union Pacific, Cheyenne, Wyo., has been appointed trainmaster at Ogden, Utah, succeeding George Brophy, promoted.

Will G. Dungan, whose appointment as superintendent of the Sterling division of the Chicago, Burlington & Quincy, with headquarters at Sterling, Colo., has already been announced in these columns, was born October 8, 1875, at Aledo, Ill. He attended the University of Nebraska 1891-1896, and began railway work in November, 1897, with the Chicago, Burlington & Quincy as axman. He held various positions in the engineering department on location, construction and maintenance, and in March, 1907, was appointed engineer maintenance of way of the Nebraska district. One year later he was appointed roadmaster and trainmaster at Orleans, Neb., and in September, 1912, was made trainmaster at McCook, Neb. He held the latter position until his recent promotion to division superintendent, as above noted.

Charles Hicks, whose appointment as general manager of the Tennessee, Alabama & Georgia with headquarters at Chattanooga, Tenn., has already been announced in these columns, was born on August 4, 1859, at Poughkeepsie, N. Y., and was educated in the high schools. He began railway work on July 26, 1881, with the Poughkeepsie & Eastern, now a part of the Central New England, serving consecutively as station agent and telegraph operator for twelve years, commercial agent for a year and a half, and as general superintendent for fourteen years. He then entered the service of the Chattanooga Southern as superintendent, and later was general manager until the latter part of 1910. Mr. Hicks was then out of railway work for about four years until his recent appointment as general manager of the Tennessee, Alabama & Georgia, the successor of the Chattanooga Southern.

Engineering and Rolling Stock

Charles A. Paquette, whose appointment as chief engineer of the Cleveland, Cincinnati, Chicago & St. Louis and the Peoria & Eastern, with headquarters at Cincinnati, Ohio, has already been announced in these columns, was born at Detroit, Mich., on April 2, 1872. He was graduated from Notre Dame University in 1891, and began railway work in July of that year as transitman for the Lake Shore & Michigan Southern. From May, 1892, to April, 1893, he was transitman on the Peoria & Eastern, and was successively assistant engineer and engineer maintenance of way until October, 1899, when he became superintendent of that road. In September, 1902, he was appointed superintendent of the Cleveland, Cincinnati, Chicago & St. Louis at Indianapolis, Ind., and in June, 1906, he was made assistant chief engineer. In December, 1913, Mr. Paquette was appointed chief engineer maintenance of way, from which position he was promoted to that of chief engineer in charge of construction and maintenance on March 1, as above noted.



C. A. Paquette

W. L. Connors, general signal foreman of the Buffalo, Rochester & Pittsburgh, has been appointed signal supervisor on the Rochester division, with headquarters at Warsaw, N. Y., succeeding M. J. Brundige, deceased.

L. F. Lonnbladh, engineer maintenance of way of the Missouri, Kansas & Texas, has been appointed chief engineer, with headquarters at Dallas, Tex. A. A. Matthews, assistant engineer of maintenance of way, succeeds Mr. Lonnbladh, with office at Dallas.

William Pelham, master carpenter of the Erie at Marion, Ohio, has been appointed inspector of bridges and buildings, with headquarters at Cleveland. J. Orcutt, master carpenter at Huntington, Ind., succeeds Mr. Pelham, and H. D. Harlow has been appointed master carpenter at Huntington, succeeding Mr. Orcutt.

V. J. Lamb, car foreman of the Charleston & Western Carolina, at Augusta, Ga., has been appointed general foreman car repairs, at that place, succeeding W. F. Weigman, who has been appointed general foreman car department of the First division of the Seaboard Air Line, with headquarters at Portsmouth, Va.

OBITUARY

P. Dowling, general roadmaster of the Delaware, Lackawanna & Western, at Scranton, Pa., died in that city on March 6.

Frederick L. Brooks, formerly claim agent of the Chicago, Indianapolis & Louisville, died at his residence in Chicago on March 3, aged 56 years.

Adolph B. L. Scrivner, formerly assistant general superintendent of the National Lines of Mexico, died at Laredo, Texas, on March 1, aged 39 years.

Frederick W. Morse, formerly and for many years general passenger and freight agent of the Montpelier & Wells River, died on March 7, at Montpelier, Vt., at the age of 70.

Marvin J. Brundige, signal supervisor of the Buffalo, Rochester & Pittsburgh, died at the Warsaw hospital, Warsaw, N. Y., on February 21, following an operation for acute appendicitis.

G. D. Bacon, formerly from 1892 to 1905 general agent of the passenger department of the Chicago, Rock Island & Pacific, with offices at Cincinnati, Ohio, and St. Louis, Mo., died at Eustis, Fla., on March 4, aged 70 years.

W. L. Bisbee, formerly superintendent of the Second division of the Houston & Texas Central, died on March 4, at Houston, Tex., aged 63 years. He was retired from the active service of the company on January 1 last, at his own request, due to ill health, at that time having served the company continuously for 41 years.

Frederick M. Hawley, superintendent of the Allegheny & Bradford divisions of the Erie at Salamanca, N. Y., died on March 4, at Bradford, Pa. He was born on September 5, 1865, at Scottsville, N. Y., and began railway work in June, 1879, as a telegraph operator on the Erie, and remained in the service of that road ever since. He then served consecutively as despatcher, chief despatcher, passenger trainmaster and division trainmaster until May, 1912, when he was appointed division superintendent of the same road.

Morton Riddle, general manager of the Florida East Coast at St. Augustine, Fla., died at that place on March 4. He was born in 1869 at Petersburg, Va., and began railway work on April 1, 1887, and was consecutively rodman, instrument man and resident engineer on the Norfolk & Western and the Charleston, Cincinnati & Chicago, now a part of the Carolina, Clinchfield & Ohio, until May, 1890. He then entered the service of the Atlantic Coast Line as roadmaster, and in November, 1901, he was appointed superintendent. He was later assistant chief engineer, until 1905, when he was promoted to general superintendent of the same road at Jacksonville, Fla., leaving that company in February, 1914, to go to the Florida East Coast as general manager at St. Augustine.

Hiram R. Nickerson, formerly vice-president of the Mexican Central, died on March 8, at North Wayne, Maine. He was born on December 13, 1853, at North Wayne, and began railway work in February, 1872, as a messenger on the Atchison, Topeka & Santa Fe. He subsequently served on the same road consecutively as telegraph operator, station agent, brakeman, conductor, train despatcher, trainmaster, division superintendent and general superintendent of lines east of the Missouri river until 1888. Then for six years he was general superintendent of the entire system. In June, 1894, he was appointed assistant general manager of the Mexican Central, and from the following December to May, 1899, he was general manager of the same road. Mr. Nickerson was then elected vice-president and general manager. He continued as vice-president until 1907.

Equipment and Supplies

LOCOMOTIVE BUILDING

THE VANDALIA is in the market for 25 Consolidation type locomotives.

THE SOUTH DAKOTA CENTRAL has ordered 1 Consolidation type locomotive from the American Locomotive Company.

THE DELAWARE, LACKAWANNA & WESTERN has ordered 5 Pacific type locomotives from the American Locomotive Company.

THE CHICAGO, BURLINGTON & QUINCY has ordered 50 locomotives from the Baldwin Locomotive Works. This will include 15 Pacific type, 20 Mikado and 15 Santa Fe type.

CAR BUILDING

THE CHICAGO GREAT WESTERN is in the market for 6 combination passenger cars.

THE CHICAGO, BURLINGTON & QUINCY has ordered 200 50-ton all-steel gondola cars from the Haskell & Barker Car Company.

THE ATCHISON, TOPEKA & SANTA FE has ordered 500 60,000-lb. capacity refrigerator cars from the American Car & Foundry Company.

THE ILLINOIS TRACTION is reported to have ordered 50 cars from the Haskell & Barker Car Company. This item has not been confirmed.

THE SAN ANTONIO, FREDERICKSBURG & NORTHERN is reported in the market for 20 60,000-lb. capacity box cars. This item has not been confirmed.

THE CHICAGO & MILWAUKEE ELECTRIC has ordered 15 all-steel passenger cars from the J. G. Brill Co., and has retained an option on 15 more.

THE BOSTON & MAINE has ordered 6 postal cars from the Laconia Car Company, and has also ordered 600 underframes from the Laconia Car Company, and 600 from the Keith Car & Manufacturing Company.

IRON AND STEEL

THE VIRGINIAN RAILWAY is in the market for 3,000 tons of rails.

THE KANSAS CITY SOUTHERN is in the market for 8,000 tons of rails.

THE TOLEDO TERMINAL has ordered 500 tons of rails from the Algoma Steel Company, Sault Ste. Marie, Ont.

THE NEW YORK, CHICAGO & ST. LOUIS has ordered 2,500 tons of steel rails from the Lackawanna Steel Company.

THE PENNSYLVANIA RAILROAD has placed an experimental order for 2,000 tons of steel rails with the Illinois Steel Company.

THE CHICAGO GREAT WESTERN has just ordered 6,000 tons of 85-lb. open hearth steel rails from the Illinois Steel Company.

THE BALTIMORE & OHIO is reported to have ordered 7,000 tons of steel rails from the Carnegie Steel Company. This item has not been confirmed.

THE GREAT NORTHERN recently ordered 10,000 tons of rails, divided among the Lackawanna, Bethlehem, Cambria and the Illinois Steel Companies.

THE NORTHERN PACIFIC has ordered 20,000 tons of rails, divided as follows: Illinois Steel Company, 8,500 tons; Lackawanna Steel Company, 7,500 tons, and the Colorado Fuel & Iron Company, 4,000 tons.

THE ILLINOIS CENTRAL has ordered 35,000 tons of 90-lb. rails from the Algoma Steel Company, Sault Ste. Marie, Ont. These rails are to be rolled under the American Railway Engineering Association specifications, with the nick-and-break test.

Supply Trade News

T. S. Leake, general contractor, has moved his offices from the Ellsworth building, Chicago, to the Transportation building.

The Railway Water & Coal Handling Company has moved its offices from the Ellsworth building, Chicago, to the Transportation building.

The Adams Motor & Manufacturing Company has moved its offices from 1716 North Kedzie avenue, to its new plant at 3918 Castello avenue, Chicago, Ill.

J. W. Fogg, formerly master mechanic of the Baltimore & Ohio Chicago terminal, has become associated with the Boss Nut Company, with headquarters at Chicago.

A. D. McAdam, formerly western sales agent of the Ralston Steel Car Company, Columbus, Ohio, has been appointed sales manager, with headquarters at Columbus.

A. B. Saurman, Pacific coast manager for the Standard Underground Cable Company, Pittsburgh, Pa., has recently been appointed southeastern manager, with headquarters at Philadelphia, Pa.

Robert E. Jennings, president of the Carpenter Steel Company, Reading, Pa., has been elected to fill the vacancy on the board of the Joseph Dixon Crucible Company, Jersey City, N. J., caused by the death of William Murray.

Sidney G. Johnson, vice-president of the General Railway Signal Company, Rochester, N. Y., in charge of sales and installations, has been elected a member of the board of directors of the General Railway Signal Company of Canada, Limited, Lachine, Que.

F. L. DeArmond, who for the past five years has been with John S. Latta, Philadelphia, Pa., representing the Manhattan Rubber Company, has been appointed sales agent of the Protectus Paint Company, with headquarters in the North American building, Philadelphia.

The Sprague Electric Works of the General Electric Company, New York, has opened a branch sales office in the Illuminating building, Cleveland, Ohio, and Frank H. Hill, who also has charge of the Pittsburgh office, has been appointed manager of the Cleveland office.

Joseph Mohr, president of John Mohr & Sons, boiler manufacturers of Chicago, Ill., died at his home on March 2, 1915. Mr. Mohr was born in Chicago in 1855, and, after serving an apprenticeship as boilermaker, he engaged in business with his father in 1882, under the firm name of John Mohr & Son, which was later changed to John Mohr & Sons.

Mussens, Ltd., Montreal, Que., railway mining and contractors' supplies, were placed in liquidation on March 5, by W. H. C. Mussen. John J. Robson has been appointed liquidator provisionally pending a meeting of the creditors. The liabilities are placed at $300,000, and the assets at $550,000. Depression in business is given as the reason for the liquidation.

A record of prompt shipment is reported by the Whiting Foundry Equipment Company, Harvey, Ill. This company received a telegraphic order for a three-motor electric traveling crane of 10-ton capacity and a 30-ft. span on January 23. The crane was to be delivered complete on the purchaser's runway at New Bridge, Del., on February 10. Drawings were made and the crane was constructed and shipped on January 29, reaching New Bridge on February 4, and it was erected complete for service by February 6.

E. S. Goodloe, storekeeper for the Eastern district of the New York, New Haven & Hartford at Readville, Mass., has left that company and opened an office in the National Metropolitan Bank building, Washington, D. C., where he will represent the Commercial Acetylene Railway Light & Signal Company, New York, the Woven Steel Hose & Rubber Company, Trenton, N. J., and the Automatic Ventilator Company, New York. Mr. Goodloe began railroad work with the Chesapeake & Ohio at Richmond, Va., and remained with that company seven years, during which time he was employed in the mechanical, store and purchasing departments. He was then appointed assistant purchasing agent of the Carolina, Clinchfield & Ohio, with headquarters at Johnson City, Tenn., which position he held for four years, and for the next six years was storekeeper of the eastern district of the New Haven, as noted above.

Railway Steel-Spring Company

The Railway Steel-Spring Company in the fiscal year ended December 31, 1914, had gross earnings of $4,351,465, as against $7,688,185 in 1913. Its total manufacturing, operating and administrative expenses and charges for repairs and depreciation totaled $3,638,180, of which $199,218 was for repairs, renewals and depreciation. The similar expenses in 1913 were $6,216,092, the charges for repairs, renewals and depreciation being $463,120. The net earnings dropped, therefore, from $1,472,092 in 1913 to but $713,285 in 1914. The company paid bond interest of $338,831, and the usual 7 per cent dividends on preferred stock of $945,000, whereupon the December 31, 1913 surplus of $4,525,203 was reduced to $3,954,656 on December 31, 1914.

The Railway Steel-Spring Company has plants and properties valued at $33,314,362. The statement for December 31, 1914, showed inventories of $1,505,072 There were also accounts receivable of $1,006,076 and $1,669,896 cash. The company has issued capital stock of $27,000,000, of which one-half is preferred. It also has bonds outstanding of $6,628,000. Its statement for December 31, 1914, showed accounts payable of $297,308.

F. F. Fitzpatrick, the company's president, expresses the belief in his report that "all indications now seem to point to a return of confidence and a feeling of encouragement, which cannot help but be conducive to a gradual revival of business throughout the country."

New York Air Brake Company

Notwithstanding the depression of the past year, the New York Air Brake Company was able "through improved methods of manufacture and close economy" to pay its fixed charges, maintain its usual dividend and increase its surplus slightly. The company's total sales were $2,915,932 or but slightly less than the $3,244,312 of 1913 and the $3,078,256 of 1912. The manufacturing costs totaled $1,740,436, leaving a so-called factory profit of $1,175,496 There was other income of $18,524, which brought the gross profit up to $1,194,020. The net profit for the year, after the deduction of administration and other expenses, royalty and taxes, was $821,046. Interest was paid of $180,000 and dividends of $599,544, the same as in 1913. The surplus for the year was thus $41,502, as compared with $54,969 in 1913 and $422,494 in 1912, when but $149,886 was paid in dividends. The total surplus on December 31, 1914, was $273,012.

The company has factories, patents, water power, land and machinery having a value of $9,974,833. On December 31, 1914, its inventories were $1,391,824, and it had $782,124 accounts and bills receivable and $525,041 in cash. The company has issued $10,000,000 capital stock, and it has bonds outstanding of $3,000,000. On December 31, 1914, the accounts payable were $109,898.

President C. A. Starbuck expresses the opinion in his report that the outlook for the coming year is encouraging. The company has already received brake equipment orders from several foreign governments and expects an improvement in domestic orders and inquiries.

TRADE PUBLICATIONS

Coal Drier.—Bulletin No. 212 of the Link-Belt Company, Chicago, describes the Wendell continuous automatic coal drier which is designed to dry washed coal for coking purposes and the smaller sizes of steam and domestic coal. The booklet is a four-page folder and contains a number of illustrations, among which is a diagram showing the method of operation of the machine.

Titanium Aluminum Bronze.—An eight-page booklet just issued by the Titanium Alloy Manufacturing Company, Niagara Falls, N. Y., deals with the use of Titanium as a deoxidizer in alloys of aluminum and copper. The booklet contains a number of extracts from reports setting forth the properties of aluminum and copper alloys, the practical casting of which has been facilitated by the use of Titanium.

PAINTS.—The ninth edition of the Review of Technical Paints, by Frank P. Cheesman, has just been issued by Cheesman & Elliott, 100 William street, New York. This book contains 52 pages, is illustrated and is intended to give anyone interested in metal painting the benefit of the long experience of this firm. Various kinds of paints are considered in detail, and information given as to the best paint to use for any particular class of work.

OXY-ACETYLENE APPARATUS.—Catalog No. 111 of the Imperial Brass Manufacturing Company, Harrison street and Racine avenue, Chicago, deals with a line of oxy-acetylene welding and cutting outfits, torches, regulators, gages and other accessories. Aside from the usual information concerning the line, the catalog contains a number of illustrations showing the torches in operation on various classes of work and samples of broken parts repaired by the Imperial outfit.

SOUTHERN PACIFIC.—"High Points on Four Great Highways to the California Exposition," is the title of an artistic and descriptive folder just issued by the Southern Pacific. It contains 78 illustrations, picturing the attractions of San Francisco and San Diego, with their expositions, as well as those seen enroute through the four gateways via New Orleans, El Paso, Ogden and Portland. A panorama of the Panama-Pacific International Exposition, 31 in. long, shows the entrance to the Golden Gate and depicts the natural beauties of San Francisco and vicinity.

OXY-ACETYLENE WELDING AND CUTTING.—The Vulcan Process Company, Minneapolis, Minn., has issued a pamphlet outlining the use of its oxy-acetylene outfit, which includes an acetylene generator, in railway shops. It contains descriptions of some of the work performed by this equipment with the corresponding savings made in doing the repairs by this method. A table is included showing the cost of cutting and the cost of welding. The cost per foot of cutting ranges from $0.0126 for ¼ in. plate to $0.041 for 1½ in. plates and the cost per foot of welding ranges from $0.045 for ⅛ in. plate to $1.24 for ⅝ in. plate.

RAILWAY LINE MATERIAL.—The General Electric Company has recently issued bulletin No. 44,004, which forms an ordering catalog devoted to railway line material for direct suspension. This publication covers practically everything in line material for this method of suspension, except poles and wire. The parts are illustrated and each illustration is accompanied by the proper catalog numbers. The prices are not included. The bulletin contains also miscellaneous data relative to construction, overhead material per mile, general data on the use of solid copper wire and copper cable, dimensions of grooved trolley wire sections, etc.

PENNSYLVANIA RAILROAD.—The Pennsylvania Railroad has recently issued a booklet, for distribution at the Panama-Pacific International Exposition in San Francisco, describing its activities and exhibit at the exposition. Accompanying a double page map for the entire Pennsylvania system, which is printed in the center of this booklet, are statistics showing the extensiveness of the system, which serves "52 per cent of the entire population of the United States." The booklet contains a photograph of the relief map of the Pennsylvania System shown at San Francisco—the largest relief map ever made, 42 ft. x 26 ft. It also contains pictures of the proposed Union station in Chicago, the main span of the East River bridge, and the model of New York City, 26 ft. square, which will be exhibited; a photograph of the latter is also reproduced in colors on the cover page.

CAST IRON PIPE.—The United States Cast Iron Pipe & Foundry Company, Burlington, N. J., has just issued a new 218-page general catalogue. The first 70 pages of this book are devoted to a general description, with illustrations, of the uses and adaptability of cast iron pipes. It relates the development of conduits and aqueducts, both with reference to material and construction, and describes the modern products and their uses as water pipe, in high pressure systems, submerged pipe, gas pipe, etc. Numerous illustrations show the method of laying these pipes. The methods of making various types of joints and connections are also explained. A general comparison between cast iron pipe and other pipes is made and causes of failures discussed. It also describes means of protecting mains against electrolysis, leakage at bell and spigot joints, etc. The next 100 pages contain specifications, tables of dimensions and weights of the various pipes and their fittings. The last portion of the book is devoted to miscellaneous foundry products, tables, and views of the company's works.

Railway Construction

ALAMANCE, DURHAM & ORANGE RAILWAY & ELECTRIC COMPANY.—Application has been made in North Carolina for a charter to build an electric line from a point in North Carolina, southeast via Burlington, Graham and Haw River to Saxapahaw, thence east to Chapel Hill, and northeast to Durham, about 50 miles. J. Harden, C. B. Cox, J. M. Cook, D. M. Teague, Burlington, are incorporators.

ARIZONA & NEW MEXICO.—This company is contemplating the construction of a 3½-mile branch line, which is to extend from Lordsburg, N. M., in a southwesterly direction, and to terminate at the "Eighty Five" mine in Grant county, N. M. The principal commodities this road will carry are copper ore, mining supplies, etc. Norman Carmichael, Clifton, Ariz., is vice-president, and P. Reisinger, Clifton, Ariz., is chief engineer.

AVERY NORTH WESTERN.—A charter has been granted this company to build a railway from Edgemont, N. C., northwest via Pineola, Linville and Montezuma to Newland, 21 miles. The proposed route from Edgemont is up Wilson creek to Grandfather mountain, thence following Ridge Pass to Wild Cat Bluff, thence through Low Gap in Grandmother mountain and through part of the Linville Improvement Company's timber lands. W. W. Barber, Edgemont, E. C. Guy, A. P. Brinkley, C. B. Dancannon and J. W. Ragland, Newland, are incorporators.

CANADIAN TERMINAL.—This company, which was incorporated in 1907, has applied to the New Brunswick legislature for an extension of time in which to build from L'Etang Harbor, New Brunswick to St. Croix, with a number of branch lines. In 1912 the provisional directors were changed to J. S. Clark, G. W. Marsh, G. W. Ganong, H. I. Taylor, W. L. E. Marsh, J. L. Clark, W. A. Mitchell and G. J. Clarke.

CHARLESTON INTERURBAN.—An officer writes that the company expects to let contracts this coming summer to build an extension of the Kanawha Valley Traction from Charleston, W. Va., southeast via Marmet, Paint Creek, Cabin Creek, Coalburg and Handley to Montgomery, about 25 miles. Track has been laid on about two miles.

CONESTOGA TRACTION.—Surveys have been made, it is said, for building an extension on the Lancaster & Coatesville division. The new line is to be built from a point about a mile east of Conestoga Park, Pa., via Witmer to Intercourse, about 13 miles.

ENTWISTLE & SOUTHERN ALBERTA.—Application has been made to the Canadian parliament for incorporation to build a railway from a point on the Grand Trunk Pacific, at Entwistle, Alta., south to the Saskatchwan river, about 50 miles. Pringle, Thompson, Burgress & Cote, Ottawa, Ont., are the solicitors.

INTERNATIONAL RAILWAY (Electric).—This company plans to build a line from Niagara Falls, N. Y., southeast along the Niagara river through North Tonawanda, to Tonawanda, thence to a point in the northern part of the city of Buffalo. The grading, track laying, etc., will probably be carried out by the company's forces, and the work calls for about 24,000 cu. yd. of embankment to the mile. The maximum grade will be 7 per cent and the maximum curvature 6 deg. There will be eight steel bridges varying in length from 50 ft. to 175 ft. The plans also call for putting up a sub-station and a car house at Niagara Falls. (February 12, p. 289.)

KANAWHA VALLEY TRACTION.—See Charleston Interurban.

MISSISSIPPI ROADS.—Construction work has been started, it is said, on a six-mile railway from a point on the New Orleans, Mobile & Chicago, at Estes, Miss., to Noxapater swamp. There will be six small bridges on the line. W. W. Estes is back of the project.

MONTREAL & SOUTH WESTERN RAILWAY & POWER COMPANY.—Application has been made to the Quebec legislature for an extension of time to build a railway from Adirondacks Junction, Que., which is on the Canadian Pacific and the New York Central, along the St. Lawrence river to the International boundary; also to build from Adirondack Junction to Sunder. The pro-

visional directors include V. Casson, L. Dansereau, G. N. Cusson and R. Grange, Montreal, Que.

Nashville, Chattanooga & St. Louis.—Surveys have been made for building an extension to the Sylvan Cotton Mills at Shelbyville, Tenn., about two miles. The construction work has not yet been authorized, and it is not probable that the improvements will be carried out in the near future.

Palm Beach & Everglades.—A contract has been given to the Everglades Construction Company, it is said, to build from West Palm Beach, Fla., west to Lake Hicpochee. It is understood that the work will be finished by March, 1916. Charles H. Baker, president, New York. (January 29, p. 211.)

Petersburg & Appomattox (Electric).—Incorporated in Virginia with a capital of $100,000 to build an interurban line from Petersburg, Va., southeast to City Point, about 20 miles. T. M. Wortham, president; B. W. La Prade, vice-president, and W. W. La Prade, secretary, Richmond. E. Wortham, Jr., A. R. Holliday, Alexander Cameron, Jr., and R. E. Dudley and the officers are directors.

Sheboygan Railway & Electric Company.—Preliminary surveys are now being made for the proposed extension of this company's line from Elkhart Lake, Wis, to Chilton.

RAILWAY STRUCTURES

Blackwell, Okla.—The Atchison, Topeka & Santa Fe is completing plans for a small brick passenger and freight station at this point.

Brooklyn, N. Y.—The New York Public Service Commission, First district, has approved the recommendation of the New York Municipal Railway Corporation, that the contract for building seven stations on the Fulton street elevated railroad, in the borough of Brooklyn, be awarded to John Thatcher & Son, the lowest bidder, who offered to do the work for $258,664.

A contract has been given to Samuel Beskin, Beacon, N. Y., for the reconstruction of the DeKalb avenue station on the Fourth avenue subway, in the borough of Brooklyn, and this work is now under way. (December 11, p. 1108.)

Chicago, Ill.—The contract for the building of the temporary freight sheds for the Pennsylvania between Polk and Taylor streets, has been awarded to the Sumner Sollitt Company, Chicago. Work will be started at once and hurried to completion.

Pampa, Tex.—The contract for the construction of the brick passenger station for the Atchison, Topeka & Santa Fe, as reported in the *Railway Age Gazette* of March 5, has been awarded to Mr. Rice of Amarillo, Tex.

The Production of Pig Iron in the United States in 1914.—The Bureau of Statistics of the American Iron & Steel Institute in its special statistical bulletin No. 1 for 1915 announces that the production of pig iron in 1914 was 23,332,244 tons, a decrease of 7,633,908 tons, or 24.65 per cent from the 30,966,152 tons of 1913. The 1914 production of pig iron is the smallest for any year since 1906, with the exception of 1908, when 15,936,018 tons were produced.

Changing the Russian Vologda-Archangel Line to Broad Gage.—The present railway line from Archangel, the Russian port on the White Sea at the south of the Dwina south to Vologda is of narrow gage instead of the Russian five foot standard. The government has recently found it necessary to increase the capacity of this line and has decided to make it a broad gage line. At the same time it has also been decided to change the location of the line, which it is felt terminates too far from the port, by constructing a new track to cross to the eastern shore of the Dwina by a bridge to be built about 75 miles above Archangel. Work has already been begun on that part of the new line from Vologda to Niandoma, 199 miles north of Vologda, and about halfway to Archangel. It is expected that the new line will be finished by the end of July. The topographical conditions which will have to be met are not favorable, as there are many swamps. It is estimated that the railway will cost $6,180,000, or about $31,076 per mile. Notwithstanding the winter, a large force is now engaged. The Russian government is also proposing to construct lines from Archangel to Kotlas, and from Archangel to Ukta and Ob, which will afford an outlet on the White Sea for freight from Siberia.

Railway Financial News

Artesian Belt.—A petition has been filed asking for the appointment of a receiver for this road, which runs from Macdona, Tex., to Christine, 43 miles.

Baltimore & Ohio.—See Western Maryland.

Cleveland & Pittsburgh.—See Pennsylvania Railroad.

Denver, Laramie & Northwestern.—The Continental Trust Company of Denver has resigned as co-receiver of the Denver, Laramie & Northwestern, and Marshall B. Smith is now sole receiver.

Missouri, Oklahoma & Gulf.—Henry C. Ferris, of Muskogee, Okla., has been appointed a co-receiver with Alexander New, succeeding Louis C. Posner.

Missouri Pacific.—Stockholders on March 9 elected the following board of directors: N. F. Brady, B. F. Bush, N. Carleton, E. A. Faust, A. J. Hemphill, W. H. Lee, E. L. Marston, E. G. Merrill, F. J. Shepard, Cornelius Vanderbilt, R. L. Williams, W. H. Williams and E. J. Pearson. The former board of directors was as follows: George J. Gould, B. F. Bush, Howard Gould, James Speyer, Kingdon Gould, E. L. Marston, E. D. Adams, J. G. Metcalf, E. T. Jeffery, E. G. Merrill, Finley J. Shepard and S. F. Pryor. The directors who resigned are understood to have represented the Goulds other than Mrs. Finley J. Shepard (Helen Gould), Speyer & Company, New York, and the Deutsches bank of Berlin. Of the new directors, A. J. Hemphill is president of the Guaranty Trust Company, New York; N. F. Brady is a director of the New York Edison Company; N. Carleton is a director of the Western Union Telegraph Company, and W. H. Williams is vice-president of the Delaware & Hudson. The directors whose names appear both in the old and new directorates are the president of the road, Mr. Bush; Finley J. Shepard and E. L. Marston, a member of Blair & Company, New York.

(See also St. Louis, Iron Mountain & Southern.)

Pennsylvania Railroad.—The Public Utilities Commission of Ohio has approved of the issue by the Cleveland & Pittsburgh of $1,482,550 guaranteed 4 per cent stock and its transfer to the Pennsylvania Railroad in payment for advances to the Cleveland & Pittsburgh.

St. Louis, Iron Mountain & Southern.—The following board of directors have been elected: B. F. Bush, N. F. Brady, N. Carleton, A. J. Hemphill, E. L. Marston, E. G. Merrill, C. A. Pratt, F. J. Shepard, E. C. Simmons, C. Vanderbilt, F. J. Wade, A. H. Wiggin and W. H. Williams

(See also Missouri Pacific.)

Western Maryland.—The Wall Street Journal says, apparently on good authority, that John D. Rockefeller has acquired a substantial interest which will give him control of the Consolidation Coal Company. Since the Rockefeller interests are in control of the Western Maryland, the assumption is that the Western Maryland will get a larger tonnage of the Consolidation Company's coal than heretofore. The Consolidation Coal Company was heretofore controlled by interests closely allied with the Baltimore & Ohio.

Western Pacific.—A press despatch dated San Francisco says that at a conference between Rudolph Spreckles and other bondholders a plan was discussed to have the Western Pacific taken over by the federal government, and that a measure would be submitted to the California legislature by Mr. Spreckles to have the legislature memorialize United States Congress on behalf of this plan.

Military Railway in Morocco.—The military railway in Morocco, which has been under construction since 1911, reached Fez on February 5.

French Rail Duty Off.—The French customs duties of $18 per metric ton on steel rails were suspended by government decree on March 4, until further notice.